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WORKING DOCUMENT

EVALUATION OF PL 480 TITLE II AND PPNS PROGRAM, SENEGAL

(PROGRAM DE PROTECTION NUTRITIONELLE ET SANITAIRE-GROUPES VULNERABLES)

Submitted to:

Agency for International Development
FVA/PPE and USAID/Senegal

Contract No. PDC-0800-C-00-3027-00

May 1984

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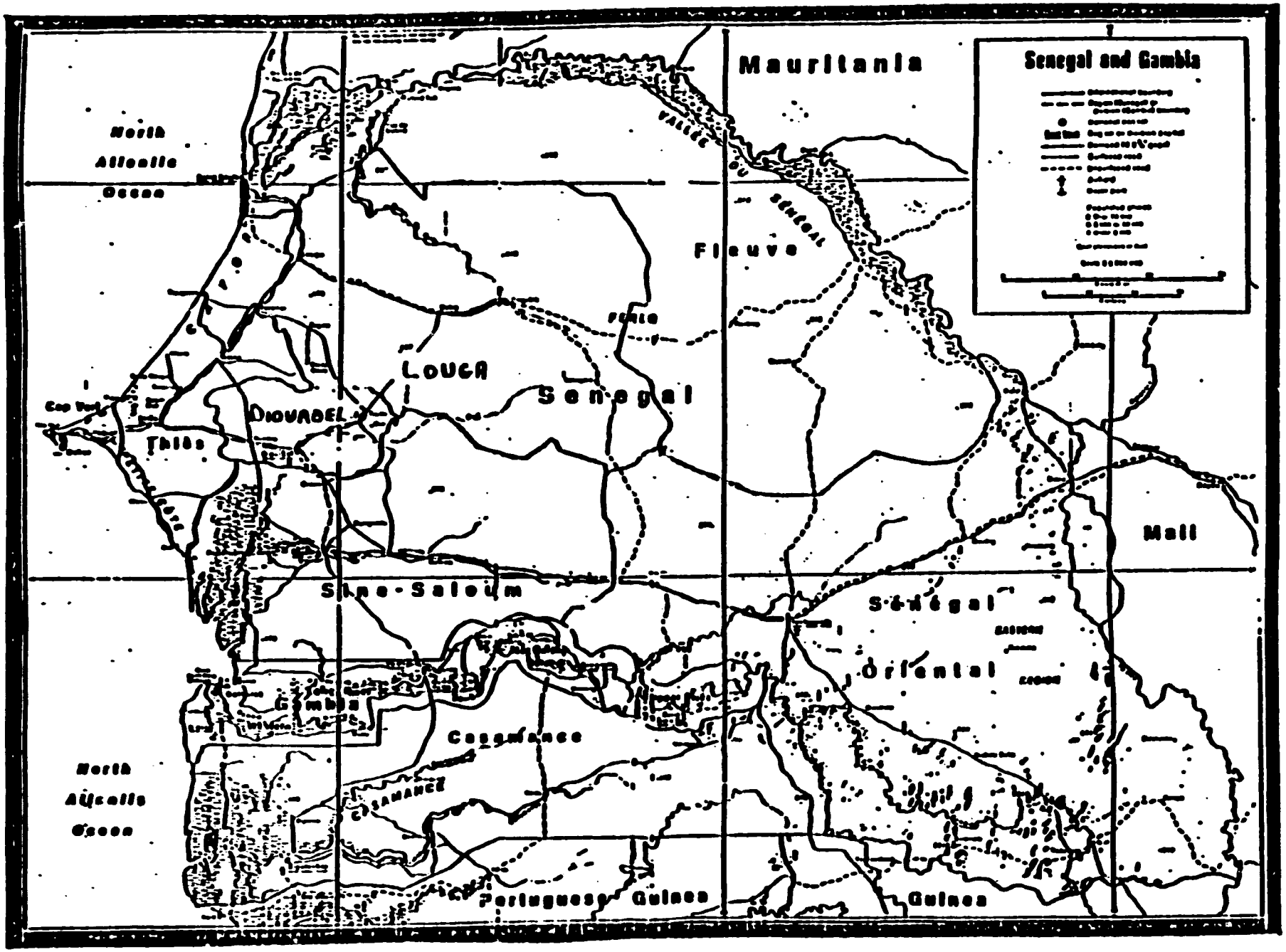
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Fleuve
LOUGA
Senegal
DIOURBEL
Thiès
Mali
Sine-Saloum
Sénégal
Oriental
Casamance
Portuguese Guinea
Guinea

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

List of Tables

List of Tables

PREFACE

This working document was produced by Dean Echenberg and Harrison Stubbs at the Western Consortium for the Health Professions, San Francisco under subcontract to the International Science and Technology Institute, Washington, D.C. The Section on field work in 45 Centers was prepared by Mr. Serigne Mbaye Diene under the direction of Commandant Mame Thierno Aby Sy. The Section on field work in 16 Centers was prepared by Ms. Joyce King. The description of how the CRS (Catholic Relief Services) program operates in Senegal found in Appendix B was prepared by Sister Fredricka of CRS Nairobi.

This document is the result of a collaborative effort of many individuals and organizations. Especially involved were Joyce King and Nihal Goonewardene of the International Science and Technology Institute, Hope Sukin and Judy Gilmore of AID/Washington; Lisa Nerenberg of the Western Consortium for the Health Professions, San Francisco; Roy Miller and Bill Drake, Community Systems Foundation, Ann Arbor, Michigan; Rick Gold, Vera La Foy, Dawn Liberie, Helen Munoz, Paul Rusby, and Mike White of AID/Dakar; Commandant Mame Thierno Aby Sy, Chief of DANAS (Division d'Alimentation et Nutrition de Senegal) with the assistance of Serigne Mbaye Diene and Mamadou Ba Sylla; Malick N'Diaye of the Ministre du Plan et de la Cooperation, Dakar; Norbert Clement, Sister Fredricka, Francoise Pilon, Francoise Diao, and Raymond Jones of Catholic Relief Services, Nairobi and Dakar; Moctar N'Diaye and Simon Chevassus Agnes of ORANA (Organization sur la Recherche Alimentation et Nutrition African); Howard Goldberg and Norman Stahling of CDC (Centers for Disease Control), Atlanta, Georgia; and Fara M'Bodj of BNR (National Census Bureau of Senegal).

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Several individuals have reviewed this document and have made important suggestions which were very helpful in making the final revisions. These people include Hope Sukin, Vera La Foy of AID Washington and Dakar, John G. Haaga, Cornell Nutritional Surveillance Program, Phillip Nieburg of the Division of Nutrition-CDC Atlanta, Robert J. Timmons and William D. Drake of Community Systems Foundation and Joyce King. The authors are sincerely grateful for their contributions toward improving this document.

In addition to these individuals there were innumerable others on whom the success of this project depended: regional and district health officers, the CRS coordinators, the program directors at the village levels, and their assistants who were all so generous with their time. The authors wish to offer special acknowledgement to the program participants themselves, especially those mothers who were willing to be interviewed and to share with us their ideas on how to improve this program.

EXECUTIVE SUMMARY

This working document contains the results of a study undertaken to evaluate the Title II food distribution program in Senegal. In addition to describing the various methodologies and results of the study, the document is meant to be a tool for increasing program effectiveness. It is envisioned as the basis for a workshop that will be held to formulate an action plan for implementing suggestions and recommendations which have emerged from the study.

These suggestions and recommendations represent a collaborative effort among AID/Washington, AID/Dakar, DANAS (Division d'Alimentation et Nutrition de Senegal), and Catholic Relief Services (CRS). This collaboration occurred not only during the initial design of the project but also throughout the data collection phase in Senegal and the analysis with on-site computers. It was basic to the philosophy of the evaluation that only with the active participation of all agencies in the design, analysis, interpretation, and recommendation phases could any needed changes be successfully implemented to ensure the best results for the children of Senegal.

A valuable contribution to the success of the project was the willingness of all participants to depart from established procedures and support the evaluation team in responding to the unique circumstances they found in Senegal.

Section I of the document describes the background of the project, its participants, and its goals. It shows how the food is distributed with the assistance of CRS in over 400 government run dispensaries (a more complete description of the CRS program is found in Appendix B.) In Senegal, the food distribution program is closely related to the Ministry of Health's maternal and child health program and the program for PFNS (Program De Protection Nutritionelle et Sanitaire-Groupes Vulnerables.) It was found that DANAS had been planning their own evaluation of PFNS. A joint evaluation committee was established whose objective was to determine if the goals of the Title II PFNS programs were being met by determining the adequacy of overall program design and by examining measured or estimated impact on the children of Senegal.

Section I also describes the team's approach to the evaluation of food supplementation programs as they relate to malnutrition. A distinction is made between epidemic malnutrition where famine and lack of food due to crop failures or drought affects all of the population and the endemic malnutrition seen in Senegal during this evaluation period. This type of malnutrition strikes children a few months after birth in association with infectious diseases such as diarrhea, pneumonia, and malaria.

Characteristic growth curves of children in the lowest socio-economic group of the less developed countries of the world are described. These curves reveal a marked decrease in growth velocity somewhere between six months and 3-4 years of age, in association with high morbidity and mortality. While normal growth velocity resumes after this period, the surviving children will be smaller than the reference population.

In designing the evaluation, the team emphasized the following: (1) the need to assume an ecological perspective toward malnutrition seen in Senegal in order to examine multiple points of potential intervention; (2) the importance

of taking a cautious and critical approach to the validity of data; (3) analysis of a comprehensive spectrum of indicators to determine program impact necessitated by the lack of sensitivity of anthropometric indicators of nutritional status in the absence of severe clinical malnutrition.

Section II of this document presents an overview of the evaluation project and a description of the circumstances in Senegal that influenced the design. The evaluation was accomplished in three phases: Phase I was the design phase, Phase II, the data collection and analysis consisting of four parts, and Phase III, a workshop.

Phase I - Design
Phase II - Data collection and analysis
- Part 1. Sine-Saloum study
- Part 2. 400 master charts from CRS Dakar
- Part 3. Growth data on 6,369 children from 45 random centers
- Part 4. Field work
  - a. 17 Centers
  - b. 45 Centers
  - c. 16 Centers

Phase III - Workshop

The four components of the data collection and analysis phase represent distinct studies. Part 1 was the evaluation of a random sample of mothers and children in the rural area of Sine-Saloum that was conducted in collaboration with CDC. This evaluation provides information which can be used to distinguish participants from non-participants in terms of size, diarrhea rates, socio-economic indicators and mortality. It further assesses mothers' knowledge of factors which cause illness and malnutrition in their children, reasons for non-participation, and the effectiveness of targeting.

Part 2 contains an analysis of summary charts from each center which are sent to Dakar monthly. These charts contain the number of children in each size decile each month. Children below a certain size relative to international standards can be thought to be malnourished. Therefore, these charts provide a monthly picture of malnutrition rates for the entire country. An unsuccessful attempt was made to find an association between a disruption of food supplies and the size of the children after the disruption.

Part 3 of the study examines the growth registers for the past three years which allowed assessment of nutritional status for children in 16 centers with usable growth data which were taken from 45 randomly selected centers. Information was available on the monthly weights of each child which allowed assessment of nutritional status based on growth rates, size at entrance, consistency of attendance, drop-out rates, and turnover.

Extensive field work comprised the fourth component of the evaluation. A preliminary investigation was undertaken during the design phase of the study when the evaluation team conducted site visits of 17 centers. This served as the basis for later data collection and field work efforts. The more formal field work was accomplished in two parts. The first was a survey of a random sample of 45 center chiefs and some regional directors conducted by the team which was collecting the growth charts for Part 3. A second field study provided detailed information on 16 of the 45 centers.

Section III of this document contains a chronological account of the data collection and analysis. It describes how much of the actual analysis of the data was accomplished collaboratively in Senegal and how the team encouraged participation by all agencies, (e.g., a package of statistical programs was sent to Senegal prior to the team's arrival so that continuing data processing could be performed there.)

Section IV of the document presents a detailed account of the methods and findings of Phase II: Part 1 of this phase was a study of a sample of all mothers and their children from the non-urban centers of the province of Sine-Saloum. This study involved a comparison participants and non-participants in villages with and without PPNS centers. In those villages where there were PPNS centers, 181 families (59.5%) had participated, 97 (31.9%) had knowledge of the program but had not participated, and only 26 (8.6%) had never heard of the program. Thirty-five of the 97 families who did not participate but who had knowledge of the program had children who were not eligible to join, (i.e., the children were too young or too old.) Of the remaining 62 eligible families not participating, 25 (38.7%) wanted to join the program but could not because either enrollment was closed or they did not know how to join.

The results suggest that the socio-economic and occupation levels of the mothers of participants were similar or slightly lower than those of the non-participants who knew about the program, but appeared higher than those of the non-participants who did not know about the program. In order to distinguish between the socio-economic status of the participants and non-participants, differences were examined in occupational level, ethnicity and religion, educational level of the fathers, mothers' ability to read French, and type of house in which the family lived.

In general, there did not seem to be much difference between the participants and the non-participants who had knowledge of the program. Some of the variables such as education level and type of house tended to portray the non-participants who knew about the program at a slightly higher socio-economic level.

The non-participants who did not know about the program, however, were very different. The trends in results indicate that they were at a lower socio-economic level than both the participants and non-participants.

It was also observed that individuals in non-PPNS villages were of consistently lower socio-economic status than those in PPNS villages.

No significant differences in weaning practice or incidence of diarrhea were observed between participants and non-participants. Diarrheal disease was found to be very prevalent among both groups with almost 50% of the mothers reporting that their youngest-born had had diarrhea during the two weeks preceding the survey. These rates where highest in children between the ages of six months and two years. When questioned as to appropriate treatment used, less than 2% of the mothers responded that oral rehydration was employed.

Despite these similarities, important differences between participants and non-participants were observed that suggest an impact of the present

educational program. During the initial field visits, it was found that pain de singe (monkey bread from the Baobob tree) is recommended by many center directors for the treatment of diarrhea. The results show that this mode of treatment is used more frequently by participant than non-participant mothers. In addition, non-participant mothers were generally much more likely to have used no treatment at all when compared to participant mothers. In addition, many more participant mothers reported that they used prophylactic nivaquine in the treatment of malarial fever. This was true even in the absence of fever. Participant children were also more likely to have received immunizations for polio, measles, and BCG vaccines against tuberculosis. Clearly, the education program has a high potential for influencing the health and nutritional practices of the mother.

The overall prevalence of diarrhea was found to be remarkably high in the children of this study. The prevalence rate among the mothers' youngest children was almost exactly 50 percent, and among all children under 6 years of age was approximately 40 percent. No significant differences were observed in these rates between participant and non-participant children or between PPNS and non-PPNS villages.

A close examination of the relationships between diarrhea prevalence and age indicated that the prevalence is relatively low among children less than 3 months old. The prevalence rate then increases and reaches a maximum among children 6-8 months old (slightly in excess of 60 percent), remains high with a gradual decline prior to 2 years, and is then followed by a rapid decline. No differences were seen in diarrhea prevalence among PPNS participants and non-participants although male children had consistently higher rates than female children.

Five different anthropometric measurements were used to assess size of the children and their rates of malnutrition. All comparisons were made using the international CDC/WHO reference populations. The measurements calculated included weight for age, weight for height, height for age, arm circumference for age, and arm circumference for height. An examination of the use of these various anthropometric measurements to define malnutrition is included in Appendix C of this document. Essentially, malnutrition is defined by the child's degree of smallness when using cross sectional data. When using longitudinal data, malnutrition of a child is defined by comparing the rate at which he gets bigger (growth) with the reference population.

Appendix C compares the use of 70% of the reference population weight per age cut off to define malnutrition for surveillance purposes with using an 80% cut off point. Although the 80% cut off is more sensitive (i.e, includes more of the actually malnourished and is preferable for screening purposes), the 70% is much more specific (i.e. includes fewer of the not actually malnourished) and probably therefore preferable for surveillance. In addition, this appendix discusses the limitation of using percent of median in evaluating the nutritional supplementation program because of the changes that occur with the age of the reference population. Relative accuracy of classification statistics and product moment correlation coefficients are presented and discussed in this Appendix for the pairs of anthropometric measures.

Almost all of the various anthropometric measures reflected the same patterns of prevalence for malnutrition with age. The general rates tended to be low

for the first six months of age, increase sharply at approximately 6-8 months of age (5-20% depending on what anthropometric cut off point is used), and then remain elevated until approximately 3 years of age when the rates decrease. This pattern was the same for participants and non-participants in villages with and without a PPNS center.

An important and consistent finding was that with very few exceptions, the diarrhea prevalence rates are higher among children defined as malnourished regardless of the choice of anthropometric measure used to define malnutrition and across all age groups. The multiple regression and discriminant analysis results quantify and emphasize the independent impacts of recent diarrhea in predicting nutritional status.

One of the most important findings in this study concerns the patterns of mortality seen in the children of Senegal. Life table analyses were performed on data derived from questions to the mothers about their children who had died. While this method would tend to underrepresent actual levels of mortality, group comparisons of patterns of mortality probably remain valid.

Program participants in PPNS villages experienced lower 5-year mortality rates than any of the other groups. The group with the most similar cumulative survival across age intervals was the participants in the non-PPNS villages.

The highest "relative risks" for death among non-participants in PPNS villages (relative to participants in PPNS villages) occurred during the age interval from 6-24 months. This is as would be expected among the non-participants in PPNS villages who had never heard of the program because they are from a lower socio-economic group. But a striking finding is that the non-participants who had heard of the program had a similarly high "relative risk" of dying in this age group even though they are at the same or slightly higher socio-economic level than the participants.

This possible increase in the mortality rates seen among nonparticipants could invalidate or compromise to some degree a comparison of nutritional status of participants and non-participant children. If more of the non-participants die and those children dying were generally smaller (as seen in the results of Part 3) the surviving group would consist of non-participant children who are better off. An analysis that does not take this phenomenon into account may be invalid. However, it is unlikely that the mortality trends seen in these two groups in this study could have seriously affected these results.

Part 2 examined the geographic distribution of the feeding centers and the size distribution of the children in these centers, and assessed changes in nutritional status based on size relative to international reference levels. The percentages of children who were less than 70% of the reference levels for weight for age were examined for all months. Marked seasonal changes in the percentage of these small children were noted, with highest rates seen in the months at the end of the rainy season, September and October. In addition, regional differences were observed with fewer small children in the urban region of Cap Vert.

Two-thirds of the centers are located in villages, and 25% are located in semi urban areas. Less than 10% of centers are located in urban areas. The urban areas seemed to have fewer malnourished children. The disruption of food

distribution occurred randomly throughout Senegal for periods of 1 to 5 months. although the disruption had a significant impact on attendance, no changes were seen in the nutritional status of the children because of the short duration of the disruption and because of other methodological constraints.

Part 3 focused on the growth pattern of children from 16 randomly selected centers with usable growth data. For some of the children, information was available on date of birth, sex, entrance and exit dates, and monthly weights. Data were available on 6,369 children of known gender and for 4, 245 children on whom entrance date was known. Ninety percent of the children entered below two years of age, and fifty percent entered at about six months of age. Very few were allowed in after three years. The turnover each month is between 1 and 3%

The nutritional status of children at entry into the program is related to age. Only 3.9% were below 70% of reference of weight/age if they enter the program at less than 6 months of age. This percentage increases for children entering between 12 and 17 months of age to 17.6%. The percent of children malnourished at entry then slowly decreases by age group at entry, (for children 18-23 months, 13.8%, 24-25 months, 12.9%, 36-47 months, 11.6%). These differences in the nutritional status of new entrants are similar to changes occurring in the general population in Sine Saloum in Part 1 and in other less developed countries (LDSs).

This general pattern of change of nutritional status with age is also seen among the program participants in Part 3. No significant differences were seen between the age specific rates of malnutrition among participants from Part 3 from Sine Saloum and the random population drawn in Part 1 from Sine Saloum. However, this may not be a valid comparison because of the mortality trends between the participants and non-participants shown in Part 1, and because this analysis did not include confounding factors on length of time in program.

Another phenomenon observed in Part 3 is the difference in the nutritional status between children of a certain age who have been in the program for a period of time and those children of the same age who enter later. Those children who have been in the program for longer amounts of time are characterized by a better nutritional status. Although selections bias related to age at entry could account for these results (i.e., mothers who are more conscious of the health of their children may enroll their babies earlier as suggested below in the fieldwork section) to some extent, these results can be considered evidence (but not proof) of nutritional impact.

Since growth is one of the most sensitive indicators of nutritional status, regression analysis was performed on the longitudinal data to see what factors were most predictive of growth during specific age periods among the program participants. For growth during the age interval of 6-12 months both sex and participation rates were significantly predictive. In addition, the number of months in the program had a small but significant independent predictive effect on change in nutritional status, (i.e., growth rates for the 12-18 months interval). This variable explained 0.5 percent of the variation in

weight for age z-score at 18 months of age which was not explained by either weight for age z-score at age 12 months or by weight for age z-score at entry.

The data in Part 3 also show the marked seasonal impact on nutritional status. The nutritional status of children in the program is worse during the months of September to October (the end of the rainy season) and seasonal differences are seen primarily in the younger children (below 12 months of age.)

Part 4 of the project consisted of the fieldwork. The team visited 17 centers in June 1982 during the project's design phase. The first part of the formal field work was accomplished in January, 1983. In the original design, these field visits had been planned exclusively to gather registers from a random sample of 45 centers. However the DANAS team also developed a questionnaire to be administered to the center chiefs which would provide an overview of the operations of the program in Senegal. Most of the centers are government-run dispensaries. Others are run by the Red Cross, religious orders and social groups. The average center serves 285 children in groups of 30-35 per visit. Most directors were state nurses with 3 years of training. Many directors stated that there had been other food distributed in the area but seldom more than once and consisting of less than 5 kg/person. This survey also showed that the most frequent causes of death among the children of the centers were malaria, measles, and diarrhea. The team also examined the growth registers and found that over 80% of the centers had data considered to be legible and consistent.

The team from DANAS also developed and administered a series of open-ended questions to the center directors and regional coordinators soliciting criticism and suggestions about the program. Responses indicated problems with lack of training on nutrition, in-service job training for agents, a shortage of demonstration materials, and supervision. Nevertheless, the survey revealed that the great majority of those interviewed recognized that the program had a real impact on the nutritional status of children. Respondents credited this improvement to the positive changes the program fosters in the attitudes and behavior of mothers regarding the way they feed their children.

The second part of the formal fieldwork was accomplished by two teams which visited 16 selected centers in May 1983. The teams interviewed 3 mothers per center and examined their knowledge, motivation, and initiative. These factors were found to be related to the length of time the mother had been in the program, directors' capability and the presence of audio visual materials. In some centers, the mother groups had initiated activities beyond the feeding program such as collective gardening and fundraising activities to earn revenue to buy medicine.

The team also examined differences in participants by age of entry of their children into the program. They found that the mothers who enroll their children at younger ages were better motivated, understood more of their children's needs and were more sophisticated. In addition, they usually had had other children in the program previously. Some mothers said that the mothers of late enrollees were negligent. However, late enrollment may be attributable to other factors. For example, we have seen in Part 1 that close to 40 percent of the mothers with eligible children wanted to enroll but were

unable to because the programs were full or they did not know how to enroll their children.

The team also examined the training of center directors. They found the training to be sporadic, brief, and devoted mainly to learning about new forms used for food distribution reporting rather than on what or how to teach mothers. In addition, they found that technical supervision for education content and techniques for teaching mothers is not provided. The center directors also expressed dissatisfaction with the lack of incentive pay for the "extra" duties performed with the food distribution and child weighing program. The team also examined center workload and availability of educational materials and food.

Section VI provides a summary of the evaluation team's assessment of program effectiveness. The conclusions were derived from an overall assessment of the programs attributes and design, as well as the actual impact on the children of Senegal, as seen in trends of improved mortality rates for participants in the program. In regards to the former, the team felt that while an attempt was made to integrate health and nutrition, in philosophy and practice, the two are perceived as separate and unrelated entities. Although an effort is made to educate the mothers on those illness and feeding factors that influence the nutritional status of their children, it was the conclusion of the evaluation team that the educational program is deficient in focus, material and training.

The Evaluation Team also concluded that because two agencies are involved, i.e., CRS and DANAS, lines of communication and authority are not always clear and so there exist problems in supervision, training coordination and motivation and training. Other aspects of program administration such as targeting and coverage, and encouragement of consistency of attendance were well carried out, although the evaluation team suggested that certain procedures be reviewed with regard to extending coverage of the program to more vulnerable children.

Based on both the data analyses and field observations, it was the conclusion of the team that the program contributes to combatting malnutrition in children and has enormous potential for further impact on the nutritional status of the children of Senegal.

Section VII provides a detailed description of those areas in which the evaluation team recommends changes for increasing the impact of the program:

1. Education programs for the mothers must be designed and implemented so as to emphasize both the health and nutritional factors associated with malnutrition in children in Senegal. This should include education on the importance of oral rehydration as well as the appropriate use of weaning foods.

2. Formal education and training programs in health and nutrition must be established for field workers.

3. Better coordination is needed between CRS and DANAS and supervisory roles of personnel must be clarified.

4. To increase the impact of the program, geographic targeting and other means should be explored to increase the coverage of the program to the most vulnerable.

5. A monthly surveillance system should be established by the government of Senegal Ministry of Health in collaboration with CRS to monitor the nutrition status of the children in the feeding centers. Data which can be used for this purpose are already being routinely collected by CRS.——

It is basic to the philosophy of this evaluation that the design of a viable action plan for carrying out the recommended changes is only possible with the active participation of all those agencies responsible. To accomplish this it is recommended that these agencies attend a workshop. The goal of the workshop is to formulate a specific action plan for each of the recommendations based on the findings of this working document.

In formulating plans for implementing recommendations based on this evaluation, the research team again emphasizes the need for the active participation of all groups involved. The workshop will provide a forum for bringing these groups together to discuss this evaluation and recommendations.

SUMMARY OF FINDINGS

This evaluation focuses on addressing three central questions:

1. Is the program reaching the most vulnerable children, i.e. the economically needy and nutritionally at risk?

2. What is the nutritional and health impact of the program on the participating mothers and children?

3. In what areas can the program be strengthed to improve its impact?

TARGETING

Geographic

The results of Part II of this study strongly indicate that malnutrition is more prevalent and demonstrates more seasonal variation in the rural areas compared to urban areas. Less than ten percent of the centers are located in urban areas and approximately two-thirds of the centers are situated in rural areas. Thus it appears that the program is geographically reasonably well-focused.

Villages

Results presented for Part 1 of this study suggest that PPNS villages (not including urban PPNS centers) are more developed than non-PPNS villages. These differences were noticed, for example, with regard to type of house, husband's occupation and education, mother's French school attendance and French reading ability, and in rates of DPT/polio, BCG and measles vaccination of youngest children. The differences, although significant and consistent, were not great. Similar differences were seen in the children's nutritional status and mortality rates.

This program depends heavily on the health delivery infrastructure of Senegal (approximately 85 percent of the centers are in dispensaries or maternities), and these results are therefore not unanticipated. The bulk of this evidence indicates that centers are not situated in the less developed communities.

Socio-Economic

Small but consistent differences were observed between participants and non-participants in PPNS villages in the Sine-Saloum (Part I) study. These findings consistently indicate that PPNS program participants are on the average of lower socio-economic status than non-participants. There is a small group of mothers (8.6%) in PPNS villages who have never heard of the program. This group of non-participants is of consistently lower socio-economic level and the children had higher mortality rates than all others. Consequently, this group seems to consist of a characteristically different group of mothers in the PPNS villages who are not being reached by the program.

Age and Nutritional

It was shown that the distribution of nutritional status of new program entrants by age resembles those of similar populations in other LDCs. All results indicate that nearly all new entrants during 1980-82 were under two years of age and slightly over one-half were under six months of age at the time of entry. It is important to continue to select young children in light of the observed malnutrition patterns of these young children. Under the age of three years, it is much too difficult to target children on the basis of size in communities where malnutrition is endemic. Essentially, the prevalence of small children with infectious disease and potential malnutrition is so high that targeting within this age group would prpbably be inefficient.

PROGRAM IMPACT

Nutritional Status

An association was observed between length of time in program and higher nutritional status of children. There was also an association observed between length of time in program and growth rates for certain vulnerable age periods. These findings were comparable to the results of other evaluations in this respect. Because of methodological constraints and potential confounding effects of self selection, however, it is not possible to attribute this association solely to the program.

Mortality

Mortality rates in the most vulnerable age groups were observed to be consistently lower for program participants than non-participants, while these two groups appeared to be from a similar socio-economic level. Evaluation team believes that the participants in the program should have improved survival rates because of a possible total program affect due to food supplementation, and/or nutrition education, observed trends toward increased vaccination rates, increased practice of preventive malaria measures and increased utilization of health services, e.g., higher rates of post-natal visits.

Health Status of Children/Use of Primary Health Care

Evaluation team believes that the program participants should have improved health status because of trends towards increased vaccination rates, increased practice of preventive malaria measures, and increased utilization of health services.

The results of this study clearly demonstrate that food distribution encourages center attendance and the use of available primary health care. Participant mothers in Sine-Saloum were more likely to return to the center than non-participant mothers for post-natal visits and their children were more often vaccinated against measles.

Mother's Knowledge of Health Care

The results of the Sine-Saloum survey suggest an impact of the educational component of the program. The data reveal that pain de Singe, one of the treatments for diarrhea that is currently being taught by the program, is used slightly but not significantly more frequently by participant than by non-participant mothers. Participant mothers also demonstrated trends towards higher rates of malaria prophylaxis and treatment than non-participant mothers.

AREAS IN WHICH THE PROGRAM MAY BE STRENGTHENED

Integration of Nutrition and Health

An attempt is made via the education program to integrate health and nutrition. In philosophy and practice, however, the two are perceived as separate and unrelated entities.

One of the most important findings of this study is the relationship between prevalence of diarrhea and lower nutritional status in children. Overall, approximately 40 percent of the children had diarrhea within two weeks prior to their mothers being interviewed during the survey. The results of Part 1 of this study provide conclusive evidence that this disease is related to age, sex and nutritional status. The age range most affected is the same as that where growth in these children declines, 6-24 months, and males had consistently higher incidence rates than females over all age groups. The authors (as have investigators at CDC) have concluded from analyses of these data that prevalence of diarrhea is also associated with lower nutritional status -- regardless of the choice of anthropometric measure for its definition.

Diarrhea was mentioned by the Medicin-chefs as being one of the most common causes of death for the children attending the centers. There were no differences in diarrhea prevalence between participant and non-participant children and a virtual complete lack of knowledge among the mothers of both groups regarding its appropriate treatment. These finding must be considered extremely important for improving program impact because of the influence of this very common disease on both the nutritional status and mortality of these children.

Targeting and Coverage

The coverage of the program is estimated to be 10.3 percent of all children under 5 years of age in Senegal. The program's targeting of the youngest age groups for new entrants is very good. However, the program population is aging (approximately 20% of the children are 3-5 year olds) which results in decreasing efficiency in coverage of children most nutrionally at risk (under three years of age). Coverage could be increased though the development and implementation of rules governing program participation. For example, targeting could be refocused to under 3 year olds or household duration of participation could be limited so that other families with young children might have the opportunity to participate.

Among those families with equal access and who know about the program, the lower socio-economic groups participate most. The approximately 10% of the population who do not know about the program are in a lower socio-economic group. At this point there are only slight attempts being made to target the most needy communities and no attempt is being made to limit the duration of a family's access to the program. The program is currently full and many children are waiting to enter.

Education of the Mothers

There is an effort to educate the mothers but the program is deficient in focus, materials and personnel training.

Training of Personnel

While programs are usually administered by trained nurses, the basic training and continuing education are inadequate to meet the needs of the program.

In addition, there is no instruction provided in how to train or supervise personnel in the field.

Supervision, Coordination and Motivation

The supervision of the program is oriented too much toward administrative matters and there is no technical supervision of the weighing and mother education sessions.

The lines of authority, responsibility and supervision of the program are not clear. In addition, there is a severe motivational problem because many of the personnel view the program as an unreimbursed and separate duty.

Workload

In certain areas of the program, personnel are overworked so that their effectiveness is impaired. This is often a problem of lack of organizational framework.

Use of Surveillance Techniques to Monitor and Manage

Growth surveillance data are used to follow center trends but are not as yet used in national programs of nutritional surveillance.

I. INTRODUCTION

A. Background

The P.L. 480 Title II food assistance program was mandated by Congress in 1954. The primary objective of the act was to combat malnutrition, especially among children. The act additionally sought to promote economic and community development in less developed countries.

In Senegal, approximately $10,000,000 worth of food is distributed annually under this program to over 100,000 children. This distribution is accomplished through the assistance of Catholic Relief Services (CRS). CRS is also charged with the responsibility of educating the mothers of recipients about those factors which influence nutritional status.

The distribution of the food in Senegal takes place in over 400 feeding centers. Most of these centers are located in dispensaries that are run by the Senegalese Ministry of Health (MOH). The operation of the food distribution program and the MOH maternal and child health programs in Senegal are therefore, closely related through the PPNS program.

As part of its on-going program of administration of P.L. 480 programs, and in accordance with congressional mandate, the evaluation office of Food for Peace and the Nutrition Office of AID, Washington, performs evaluations of its Title II food distribution programs throughout the world. This evaluation project is part of that process. In addition, AID/Senegal requested the evaluation as part of an examination of its entire program in order to improve planning and to integrate its nutrition and health projects. Additionally, the Division of Nutrition of the Ministry of Health DANAS (Division d'Alimentation et de la Nutrition Appliquee au Senegal) had been planning their own evaluation of the PPNS (Program de Protection Nutritionelle et Sanitaire - Groupes Vulnerables) program in compliance with its mandate to evaluate the program for the Senegalese Government.

A joint evaluation committee was established which consisted of the evaluation team from International Science and Technology Institute (ISTI), Washington, D.C. and representatives from AID/Dakar, DANAS, and CRS. The aim of this committee was to determine if the objectives of the program were being met. This objective was to be accomplished by determining the adequacy of program design and by examining measured or estimated impact on the children of Senegal. On the basis of these determinations, the committee was to then implement changes that were recommended to improve the functioning of the program.

The group designed the evaluation in three phases (see Figure 1). Phase I consisted of the evaluation design, Phase II included data collection and analyses and Phase III will be a workshop to discuss evaluation findings and recommendations and develop a viable action plan based on the evaluation findings.

FIGURE 1

EVALUATION OVERVIEW

PHASE I. Evaluation Design: June 1982

PHASE II. Data Collection and Analysis: December 1982 to December 1983

- **PART 1.** Sine-Saloum Survey in conjunction with CDC
- **PART 2.** Master Charts Analysis (457 Centers)
- **PART 3.** Growth Data Analysis (45 Centers)
- **PART 4.** Field Work
  - a. Initial Design Phase 17 Centers: June 1983
  - b. Interviews with 45 Center Directors: January 1983
  - c. Visits to 16 Centers: May 1983

PHASE III. Workshop - 1984

B. Approach of Evaluations of Food Supplementation Programs

The impact of intervention programs on nutritional status in populations where there is famine is readily demonstrated. In these instances of epidemic malnutrition resulting in many cases of severe clinically apparent malnutrition such as morasmus and kwashiorkor, the impact of intervention programs has often been documented in all age groups with acute dramatic changes observed in the most crude markers of nutritional status such as size, growth rates, levels of physical activity and short-term cognitive functioning.

But a different kind of malnutrition is seen in most of the world today. This is an endemic type of malnutrition that strikes children in the lower socio-economic groups of less developed countries a few months after birth. The epidemiology of this type of malnutrition has been extensively documented in Asia, Latin America, and Africa. Characteristically, the children are born only slightly smaller than their counterparts in the higher socio-economic groups in their own country. At about six months of age, however, there is a rapid fall off in growth, accompanied by marked increase in morbidity and mortality. This decline in health and nutritional status in this age group is a result of a complex interaction of factors that influence food intake, absorption, and utilization. The growth velocity of this cohort of children characteristically remains low and the morbidity and mortality rates remain high until the children reach the ages of three to five (varying according to local conditions). After this age, mortality and morbidity rates among these children decline, and growth velocities increase. As a result of these factors, surviving cohort is composed of smaller children growing at a normal rate (relative to a reference population) but following a parallel but lower growth path than they were on following birth.

Given the pattern of changes in nutritional status that occurs among populations with this type of endemic malnutrition, the determination of the effectiveness of intervention programs evaluated on the basis of participants' growth or size as markers of nutritional status has been difficult and controversial. The hazards of interpreting the results of these studies are becoming well known.

A recent article in the American Journal of Clinical Nutrition reviewed the overall impact on growth of 200 intervention programs in which food supplementation was a major component. When the studies controlled for the effects of other health interventions such as immunization and the changes expected in the natural course of disease, and using growth as the determinant of impact, "surprisingly small results" were found. The authors cautioned that this does not mean there was no impact and indeed they implore investigators to begin to examine other important functional markers of nutritional status which might be more important than size in evaluating the health and social development of children. For example, children following normal growth rates might still show compensatory decreases in either psychological or physical activity. Investigators are beginning to document this observation and some believe that the use of growth or attained size to judge the impact of food supplementation programs may be misleading in populations with this type of malnutrition. This is especially true for children who have reached the age of three to four years

and have "normal" growth rates for their size. These children may still have other more important functional deficits.

Recent articles in peer-reviewed journals of nutrition and public health have criticized the design methodology and interpretation of many food supplementation studies. Some of the shortcomings cited include (1) failure to control for the effects of such confounding factors as the natural changes in nutritional status that occur with age, (2) self-selection of the healthier children into the program, and (3) apparent increases in the health and nutritional status of the program population due only to selective removal of participants through high mortality among the smallest and unhealthiest children.

In addition, numerous studies have attributed nutritional or growth impact to the food supplementation alone when, in fact, other integral components of the supplementation program could have contributed to the apparent impact. However, to date it has not been possible to separate the effects of these various program components on nutritional status impact. For example, among the primary causes of diminished nutritional status among children after six months of age are infectious diseases (e.g., measles, malaria, pneumonia, diarrhea) as well as changes in feeding patterns. Since food supplementation programs all include periodic monitoring and growth surveillance of children in the program, clinical intervention will often occur among children who become sick. Thus a clinical component is always present. Given these circumstances, it has been extremely difficult to devise ethical means of studying the nutritional impact of individual program components.

The evaluation team was well aware of the shortcomings and complications of these evaluations and acknowledged the critical importance of a valid and rigorous approach to evaluating program impact. However, they were also aware of the importance of balancing this caution with the need to obtain information on which to base policy decisions.

The use of systematically biased results in quantitative data can be misleading. Such results may encourage policy-makers to abandon valid impressions of the effectiveness of a program based on their own qualitative results in favor of opposite conclusions. Therefore, the evaluation team attempted a cautious approach to data gathering and analysis to obtain a comprehensive evaluation of the program's strengths and weaknesses that would be useful in guiding those responsible for the future directions of the program.

Prior to proposing any evaluation in Senegal the evaluation team emphasized the importance of the following: (1) a critical approach to data collection, analysis and interpretation; (2) an ecological model; and (3) a wide range of criteria to judge impact.

1. A critical and cautious approach to utilization of data. The team believed that quantitative analysis should not be attempted unless valid and representative data could be obtained.

2. The necessity of using a wider biological and ecological approach to the etiology of malnutrition in order to evaluate the appropriateness

of the interventions. This would be accomplished by examining important factors other than food intake alone such as incidence of diarrheal diseases which also influence the nutritional status of children. (See Figure 2.)

This view of malnutrition in Senegal conforms to a broad ecological model which emphasizes the natural history and epidemiology of the disease in order to identify multiple points of intervention. Both decreased food intake and decreased food absorbtion are seen as being important in the etiology of malnutrition. Four main intervention strategies are highlighted, i.e., education, food supplementation, disease treatment and prevention, and surveillance.

3. Current methods that examine only size and size change as indicators of nutritional status among children in the absence of severe clinical illness are not very sensitive and thus might not reflect changes that occur. Therefore, a comprehensive spectrum of indicators of program impact and effectiveness should be employed. This is especially true for populations with widespread endemic early malnutrition where the long term social and psychological deficits produced in these children are as yet unknown.

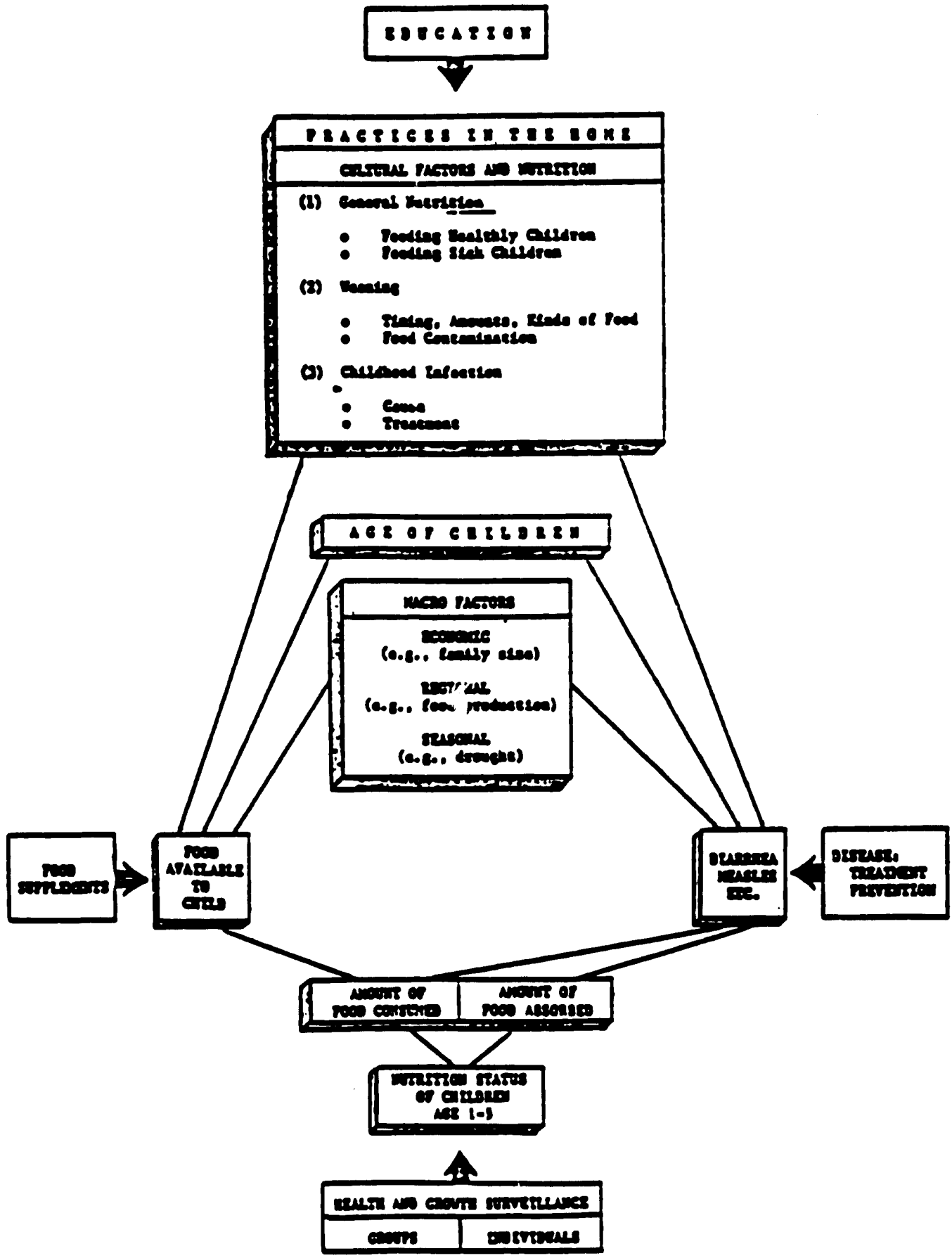
Consequently, the nutrition team attempted to include many criteria to judge the program's effectiveness. Among those we considered were the following indicators of program impact:

- Change in nutritional indicators such as size and growth of children;
- Change in health status:
  - Morbidity
  - Mortality

The Evaluation team also believed that the following process indicators were also very important to consider in evaluating the program's effectiveness:

- Integration of health and nutrition in program;
- Participant selection/targeting and coverage;
- Consistency of attendance;
- Effect of education on all factors which influence nutritional status;
- Personnel training, supervision, coordination and motivation;
- Workload;
- Food delivery, adequate ration composition and regularity of delivery;
- Cooperation between responsible agencies;
- Community involvement;
- Use of surveillance techniques to monitor and manage nutritional status;
- Institution-building;
- External dependency and use of indigenous food.

FIGURE 2. CAUSATION AND INTERVENTION MODEL FOR ENDEMIC MALNUTRITION



II. OVERVIEW OF PROJECT

This evaluation consisted of three phases: Phase I, the evaluation design; Phase II, data collection and analysis, Phase III, the workshop.

A. Phase I

During Phase I the evaluation team from ISTI arrived in Senegal in May, 1982 and visited 17 PPNS feeding centers. In addition, they held extensive discussions with CRS/Dakar, AID, and MOH representatives from DANAS. A report of this trip is found in the draft document "Evaluation Proposal, PPNS/Cathwell Title II in Senegal, May 20, 1982 Dakar."

Phase II

During Phase II, data were gathered in Senegal according to specifications of the design team. These data was sent back to the Western Consortium for the Health Professions in San Francisco for preparation and preliminary analysis. An integral part of this phase of the evaluation was to be the further analysis of this data in Senegal. To this end, the evaluation team returned to Senegal to continue analysis and incorporate participants' suggestions as to further uses. We believe that this critical and cooperative approach to the data ensured its validity and acceptance. Phase II also included a field study to address other aspects of the program such as education, management, supervision, and training issues.

Phase II, the data collection and analysis was designed in four parts (see Figure 3): Part 1 was a study done with CDC in Sine-Saloum, Part 2 was an analysis of the data collected from all 457 feeding centers, and Part 3 was the analysis of the growth data of over 6,000 children from 20 randomly selected centers. A fourth part, the field work, consisted of three sections, the first of which has a visit to 17 centers during the study design. The second section was a series of interviews with the 45 center chiefs randomly selected, and was carried out when the growth data was collected for Part 3 in January of 1983. A third component of the field work was a series of site visits to yield more extensive data on 16 of the 45 centers to examine specific program components. These 16 centers were chosen by the representatives of the working group on the basis of location, size and other selected criteria.

Phase III

Phase III is to be a workshop for program leaders to devise a plan for implementation of the needed changes. This working document includes the recommendations of the evaluation team and an outline of the topics for discussion at the workshop. It is hoped that this document will be studied by all participants prior to the workshop and will be the basis for the discussion in the main areas where the program is to be modified. These topics represent areas in which the team feels the program could be improved. The team has suggested that DANAS, CRS and AID/Dakar meet in the interim to work out an agenda. The specific goal of the workshop is to discuss this evaluation and produce a detailed and viable action plan to implement recommended program changes based on the evaluation results.

FIGURE 3

EVALUATION OF PPNS/CATHWEL CENTERS

	Description of Data Base	Data Source	Kind of Information Obtained	Questions Answered*
PART 1	Random sample of all children under five in Sine-Saloum of which 10% are estimated to be in PPNS. (N=3-6000)	GOS/USAID/CDC Health Status Survey in October 82, with information on mothers and their children in Sine-Saloum.	For each child (1) Weight & height at of survey. (2) SEC level of family (3) PPNS participation yes or no. (4) Reason for non-participation. (5) Participation in other feeding program (6) Knowledge of mothers about causes of malnutrition.	(1) Comparison of SEC level of participants & non-participants in PPNS. (2) Reason for non-participation in PPNS. (3) Comparison of attained size of participants and non-participants controlling for age, SEC level, family size, and education level. (4) Knowledge of participant and non-participant mothers about malnutrition.
PART 2	All PPNS/Cathwel centers functioning from April 1981 to August 1982 (Approx. 400-450)	All raw data available from Cathwel/Dakar, consisting of aggregate center data only.	For each month for each center (1) Amount of food distributed per beneficiary each month (food disruption for many centers was Feb.-May 1982). (2) Number of children in each weight for age centile from 60 to 100% of reference level. (3) Quantification of harvests and other available food stocks in the area.	(1) Comparison of % children under 70% weight/age before and after food interruption. (2) Seasonal and regional variations as measured by different levels of weight/age, i.e., under 70% vs. 80% to test sensitivity of indicators. (3) Effect of food interruption compared in areas of poor and good food reserve.

*Formulated during Phase I and later amplified and supplemented with other questions.

FIGURE 3

EVALUATION OF PPNS/CATHWEL CENTERS

	Description of Data Base	Data Source	Kind of Information Obtained	Questions Answered*
PART 3	1 random sample of 45 out of 400 centers for analysis. Individual monthly growth records of all PPNS participants since 1979. (Estimated 8000 children.)	Photocopies of growth registers located in PPNS centers, consisting of monthly weight for each child.	For each child (2) Weight each month since enrollment (3) Birth date. (4) Birth order. (5) Father's occupation (6) Dates of: last visit, voluntary drop out, exclusion, or death.	(1) Age & weight at entry (targeting). (2) Growth characteristics of drop outs. (3) Participants by age grouping. (4) Effect of various factors such as food and program quality on growth. (5) Quality of education.
PART 4 FIELD WORK	(A) 17 centers (B) Survey of directors of 45 centers.	Design team visits, 6/82 Interviews with 45 center Directors, January 1983, randomly chosen for Part III.	Information for study design For each center (1) Center setting characteristics. (2) Details of education program (quality). (3) Knowledge & experience of center directors. (4) Months food not distributed (this information available at Cathwel/Dakar). (5) Other food distributions.	(1) Which program inputs correlate with improved nutritional status at the center level? (2) How can the program be strengthed to improve the impact? (3) Quality of program management, e.g. supervision, treining of staff and coordination among agencies.

(C) Survey of 16 Centers, May, 1983

*Formulated during Phase I and later amplified and supplemented with other questions.

B. Factors That Influenced the Evaluation Design

The evaluation team designed the evaluation primarily to meet the needs of and in conjunction with, the people who administer the program. In designing the study, the team hoped to accomplish four primary objectives. First, information was to be obtained which would illuminate the epidemiology of undernutrition in children in Senegal by a systematic examination of its distribution and the associated factors that might influence its prevalence. Second, there would be a study of the differences between families and children participating in the program and those not participating. Third, the evaluation would include an investigation of a possible association between short term interruption of food supplementation and the size and growth of a population of children participating in the FFNS program. Because of methodological difficulties encountered in this kind of investigation, we were not expecting to find an association. Nevertheless, this part of the project was attempted in light of its potentially significant findings and the relatively low cost and effort involved in collecting and analyzing the data. Lastly, the evaluation would include an examination of overall program components such as the targeting of susceptibles, turnover of program participants, and education of parents, etc. These components would be examined through determining the adequacy of the program design in order to determine whether the objectives of the program were being met.

There were many factors that contributed to the manner in which this evaluation proceeded. There were unique circumstances in Senegal which the evaluation design team found could be used to the mutual benefit of the evaluation and all involved groups. The first of these circumstances was the availability of various types of growth data. In Senegal, the monthly weights of all children seen in each center and their birthdates, are registered in accordance with guidelines issued by the MOH. In addition, CRS/Dakar receives monthly reports on the size of the children in each center, and the amount of food distributed per child. This is a part of CRS/Dakar's routine surveillance and monitoring system.

Secondly, there was an accidental disruption of the food supply to many of the feeding centers in early 1982. The evaluation design team hoped that this rupture, along with available growth data, might provide a demonstration of the impact of the food supplementation component of the program.

Third, the evaluation team discovered that a cooperative study was being planned by CDC and BNR (Senegal Bureau of the Census) which would consist of a survey of a random sample of all mothers in Sine-Saloum and include the measurements and weights of all their children under six years of age. The evaluation team was able to suggest some additional questions for the survey to differentiate participant and non-participant families while controlling for access to feeding centers. They were further able to suggest questions which would assess the mothers' knowledge of factors which might be related to their children's nutritional status. This survey would provide a description of the nutritional status of all the children in the region using the anthropometric measures of weight/age, height/age, weight/height arm circumference for age, and arm circumference for height.

Fourth, the evaluation team identified a computer at the Ministry of Finance in Senegal, which, with the addition of some technical aid, could be utilized to allow all groups to participate in the in-country analysis of collected data.

Because, at that time (May 1982), the computer facility in Senegal did not have statistical programs available, it was decided that the data would be collected according to the evaluation team's specifications, and then sent to the Western Consortium in San Francisco for key punching, editing and initial analysis at the University of California at Berkeley. With the help of ORANA, an African multi-national nutritional organization in Senegal which sometimes provides other technical assistance to DANAS, further processing and analysis could be done in Senegal. This would also furnish the Senegalese with their own data base to utilize in later planning and studies.

Lastly, this joint approach would ensure that the evaluation would be oriented to providing a secure base for future planning. Given the fact that all participants would engage in a dialogue about the important issues throughout the evaluation, it was the hope of the evaluation team that this process would ultimately facilitate the implementation of any important changes in the program recommended as a result of their findings.

The final phase of the evaluation (Phase III) is to consist of a workshop in Senegal to review all findings, assess their implications for change, and discuss together the mutual impact of any recommended changes. The goal of the workshop would be to formulate a detailed viable action plan for implementing those changes before issuing a final report.

III. DEVELOPMENT OF PHASE II

A. Data Collection in Senegal and Preliminary Analysis in the United States, December 1982 - April 1983

The collection of data and preliminary analysis took place from December 1982 until April 1983. The data were collected from three sources.

The survey in Sine-Saloum province, which provided the data for Part I, was administered in November 1982. The survey utilized a random sample of all the children outside of the large cities. A questionnaire was served to the mothers and the children were measured. These data were key punched in Senegal and then sent to CDC, Atlanta. A quick preliminary editing was done in April 1983 to provide a working database for further use in Senegal. After the meetings held in Senegal in May, 1983, further analysis was suggested and final work on this data base was accomplished in January, 1984, in San Francisco. The clinical examination of a sub-sample of children in Sine-Saloum was performed by DANAS who analyzed the results in Senegal.

Data collection for Part 2, an examination of the master charts at CRS/Dakar, began in February, 1983. These data revealed the percentages and numbers of children in different categories of nutritional status for each of 400 feeding centers for the past 24 months. Information on food distribution was included to characterize each center. After being photocopied in Senegal, the master charts were sent to San Francisco for key punching. The master charts for the region of Thies did not arrive in time and were not included.

Data for Part 3 where taken from the registers of a random sample of 45 operating PFNS centers. These registers included the weights on each child each month over the previous three years. A team in Senegal visited each center, obtained the growth register and asked the chief of the Center a set of questions. The registers and the questionnaires were then photocopied and sent to San Francisco.

Although not envisioned in the original design, the team, on their own initiative, devised another questionnaire to be used during their visits to these centers. The purpose of this effort, led by DANAS, was, partially, to generate support for the evaluation from the center directors by giving them an opportunity to present their views regarding the program and to assess constraints and solutions from the field. As a result of this work, DANAS drafted a separate report based on the visits to all 45 centers, which was edited for this working document. This DANAS team also evaluated the growth registers they collected.

All usable growth data received in San Francisco was key punched, verified, and cleaned. The initial analysis was done in accordance with the evaluation design protocol. These preliminary examinations served to establish the validity of the data by seeing if expected results were found (i.e., the growth data were inspected for seasonal, as well as age and sex specific differences). In addition to cleaning the data and examining its validity, initial attempts were made to evaluate program impact on nutritional status as defined in the protocol.

In January of 1983, the evaluation team arranged for the BMDP statistical package to be sent through ORANA to the Ministry of Finance of Senegal. The provision of these BMDP programs was an important facet of the transfer of technology inherent in this evaluation since there were no comparable statistical programs available in Senegal at this time. These BMDP programs were prepared by ORANA for use in the in-country evaluation scheduled for May 1983. At that time, the data which had been processed and put on computer tapes would be further analyzed by all the evaluation participants.

B. Field Work and Analysis in Senegal, May 1983

Prior to their trip to Senegal the evaluation team presented their preliminary results to AID/Washington for comments and guidance. After arriving in Senegal the evaluation team presented selected preliminary results to all representatives from AID/Senegal, DANAS and CRS. During this meeting the selected results were discussed and critiqued in detail by the entire group. Subsequently, the preliminary results were discussed in small working groups so that all participants had the opportunity to examine the data in detail and to discuss the findings more intimately with members of the evaluation team.

This process was valuable in eliciting ideas for the direction of further data analysis since these groups were able to pose questions reflecting their own needs and concerns. Most importantly, representatives from AID/Dakar, CRS, and DANAS all contributed to the continuing analysis of the data. This approach fostered a common understanding.

The in-country data analysis was accomplished using the data files for Parts 1-3, which had been brought to Senegal on magnetic tapes by the evaluation team. All data files were turned over to DANAS and a representative from ORANA performed all necessary statistical analyses using the BMDP statistical programs.

As a result of the on-going data analysis in Senegal, many statistical results were refined and new important findings were obtained. However, because of time constraints and occasional unavailability of the Ministry of Finance computer system, certain important analyses could not be accomplished. A comprehensive list of further analyses of data from Parts 1-3 to be performed in the U.S. was compiled by the evaluation team with the assistance of the representatives of AID/Dakar, DANAS and CRS.

In addition to the analysis of the data for Parts 1-3, on additional field study was mounted to include 16 centers. Questionnaires were developed in Dakar by representatives of CRS, DANAS, and AID. Two field teams were sent out to visit centers in the Northern and Southern parts of Senegal. As a result of efforts to include representatives from all agencies on both teams, the trips fostered a great deal of fruitful collaboration and laid the foundation for positive future interactions.

During these field trips, questionnaires were administered to the center chiefs, the heads of the committees of mothers, and selected other mothers. A separate questionnaire was administered to all regional medical offices by DANAS. Some of the questions were constructed to obtain additional

information on issues raised by the results of the data. Other questions were included to meet the needs of CRS, DANAS or AID.

Following the field work and the data analysis, a series of meetings were held in Senegal to consolidate the findings and to integrate the results of the field work with the data analysis. A preliminary document was prepared. From these discussions, the evaluation team completed a summary of program effectiveness on which they based their recommendations to improve program effectiveness.

C. Further Analysis in United States, November - January 1984

Following the data collection and analysis phase in Senegal in May, 1983, DANAS, CRS, AID.Washington, and AID/Dakar presented lists of further requirements from the data. The further analysis included the addition of the master charts from centers which had been previously excluded. These were centers whose data on nutritional status for participants was acceptable, but for which there was no food data, and had, therefore, not been used in the initial stages of the analyses. These centers' data were now included in the surveillance analyses for Part 2. The analyses for Part 2 were repeated using data which had been cleaned in accordance with procedures suggested by CRS. All of the data for Part 1 were reanalyzed because the initial reports were incomplete. Finally, in addition to further editing and analysis of Part 2 data, the growth data for Part 3 in those centers for Sine-Saloum were compared to the growth data available from non-participants in PFNS villages which had been collected at the same time for Part 1.

This further analysis was accomplished by Western Consortium for the Health Professions in San Francisco. The data was then organized into the present working document.

IV. RESULTS OF PROJECT

A. Part 1

1. Methods

a. Sample and Procedures

From November through December 1982, a survey was conducted of a random sample of mothers and their children less than six years old in the non-urban areas of the Region of Sine-Saloum. This household survey was requested by USAID/Senegal to provide baseline data on family planning, maternal-child health and nutrition in the area served by the Rural Primary Health project of the Sine-Saloum. Questions regarding participation in PPNS/CRS feeding programs were suggested by the Title II evaluation team for inclusion in the survey instrument.

The survey was performed by the National Census Office of Senegal, Bureau National de Recensement (BNR) with technical assistance from the Program Evaluation Branch, Division of Reproductive Health, Center for Health Promotion and Education of the Center for Disease Control (CDC), Atlanta. A clinical evaluation of a subsample of children in the regions of Kaolack and Kaffrine was performed by DANAS. The following descriptions of the methods used in the survey has been abstracted from CDC memos and the DANAS mission report.

The sample universe was all ever-married women between 15 and 44 years of age, and all unmarried women who had ever had a live birth. These women were randomly selected exclusively from areas not served by hospitals or large health centers. Specifically excluded from the sampling frame were capital cities of departments and larger towns. These areas comprised a population of approximately 200,000, and constitute from 15 to 20 percent of the population of the Sine-Saloum Region.

In the first stage of sampling, 80 census tracts (out of 957 in all of Sine-Saloum) were randomly selected with a probability of selection proportionate to the size of the census tract population reported in the 1976 census.

In each census tract the field team supervisor numbered the village concessions (compounds) according to detailed maps. Clusters of ten consecutive concessions were chosen for interview from the list with the starting point corresponding to a preselected random number. When the random number fell within ten concessions of the last one for that village, the team would proceed to the next village listed for that census district and continue with the first concession until ten concessions had been sampled in the district.

In some of the 80 census tracts, the ten concessions were taken from more than one village. Information was obtained to characterize 126 villages in the 80 sampled census tracts.

It was predicted that there would be three mothers available for interview in each concession. The mothers were questioned by female interviewers

utilizing an instrument that had been field tested in April 1982. The additional questions suggested by the Title II evaluation team were later tested separately before being included in the final instrument.

While the mothers were being questioned, all of their children less than six years old were weighed and measured. A BNR worker was trained to use CDC Nutrition Division methods and instruments to obtain the childrens' heights, weights, and arm circumferences.

In the departments of Kaolack and Kaffrine, a second survey team from DANAS followed the main team three days later. The DANAS team performed clinical examinations on all the children and asked additional questions of their mothers.

Information from the sample collected by CDC and BNR was coded and keypunched in Senegal and then sent to CDC Atlanta for editing and preliminary analysis. The initial data editing and cleaning and the selection of pertinent variables for the Title II evaluation were begun the week of April 18 in Atlanta so that these data could be brought to Senegal with the Phase II evaluation team on May 3. The initial cleaning of the data and the analytic results were regarded as preliminary. Following the teams return, the data were re-edited and additional analyses were performed at University of California, Berkeley computer facilities.

b. Information Obtained

(1) Village

Information was obtained to characterize each village included in the survey. This information included data on water sources and distance to schools, markets, cooperatives, health posts and PFNS/CRS feeding centers.

(2) Characteristics of Mother and Family

Socio-economic levels of the mothers were primarily defined using a method developed by the BNR. This method, which has been used in many other Senegalese surveys, utilizes information on the materials used in house construction to characterize degree of modernity (modern, semi-modern, traditional and semi-traditional). See Figure 4.

Other indicators of socio-economic status which were obtained included education, husbands occupations, ethnicity, religion and marital status.

Extensive information was obtained on reproductive history, family composition, attendance at pre- and post- natal clinics, breast feeding practices and weaning history of youngest child for each mother. Information was also obtained on each mother's attendance at PFNS/CRS feeding centers, and whether or not she had received food from other distribution programs during the previous year.

FIGURE 4

CLASSIFICATION OF HOUSES IN SURVEY BY ROOF AND WALL MATERIAL

Wall Material	Brick Cement Concrete	Tile Slate	Straw Thatch	Other
Brick Plaster Cement	Modern	Modern	Semi-Traditional	Semi-Traditional
Brick Plaster Cement		Semi-Modern	Semi-Traditional	Semi-Traditional
Mud		Semi-Traditional	Traditional	Traditional
Straw Thatch		Semi-Traditional	Traditional	Traditional
Metal		Semi-Modern	Semi-Traditional	Semi-Traditional
Other		Semi-Traditional	Traditional	Other

The nutritional status of each child was determined anthropometrically using the child's height, weight, arm circumference, and age.

This information was processed using computer programs developed by CDC to obtain percent of median, percentile and number of standard deviations from normal (Z-Score) for each child using the NCHS-WHO standards for weight per age, height per age and weight for height. Percent of median, percentile and Z-Score for arm circumference for height and arm circumference for age were also obtained using standards currently being developed by CDC.

Information regarding mothers' knowledge of conditions which influence a child's health and nutrition status was also obtained. The criteria used in this assessment included mothers' preferred method of treating diarrhea and whether or not prophylaxis against malaria was used during "hivernage."

(3) Characteristics of Child

Information was obtained on the current or past participation status in a PFNS/CRS feeding program for each child under six years of age. Length of participation in the program was also obtained for both present and past participants. When possible, this information was confirmed using the child's health card. Each child's birthdate was also obtained.

Information was also obtained on each child for factors which might influence health and nutritional status. It was determined if the child had had diarrhea in the two weeks prior to the survey and, if so, what treatment had been used. Information was also obtained on the use of malaria prophylaxis by asking if the child had been given chloroquine either with or without a fever during the last "hivernage." Immunization status was determined for each child for polio/DPT, BCG, and measles. Detailed information on other presenting symptoms of children who died was obtained and analyzed to ascertain cause of death.

c. Analysis of Participants and Non-Participants

The analysis of participants and non-participants in the PFNS/CRS program controlled for the presence or absence of a feeding center in a village and distance to the nearest center. Using information from the village dossier, the villages were separated according to presence or absence of PFNS centers. Examination of participant and non-participant differences was performed separately for those villages in which had or did not have a PFNS/CRS feeding center. In addition to the non-participants who did not know about the program were analyzed separately from those who knew about the program and chose not to participate.

Those villages without feeding centers were further stratified according to distance (less than 5 km, between 5 km and 15 km, and greater than 15 km) to the nearest village with a PFNS/CRS feeding center. There were very few program participants living in villages located more than 5 km from a PFNS center.

2. Results, Part 1

a. Characteristics of Participants, Non-Participants, and Villages

Table 1, page A-1, shows that of the 1,662 mothers interviewed there were 304 who lived in villages with a PFNS center. Of these 304 mothers, 181 (59.5 percent) currently or previously had a child enrolled in the PFNS feeding program. Only 165 (12.1 percent) of the 1,358 mothers interviewed from non-PFNS villages had ever had a child enrolled in the program . There were 26 mothers (8.6 percent) in PFNS villages who had no knowledge of the program, whereas 414 mothers (30.5 percent) in non-PFNS villages reported no knowledge of the program. All comparative analyses of participants and non-participants were conducted separately for villages where there was a feeding center and those in which there was not.

All mothers who had never enrolled any of their children in a PFNS feeding program and who had heard of the program were asked their reasons for never having participated. Table 2, page A-2, presents the results. Thirty-five (36.1%) of these mothers had children who were not eligible for the program. Results are presented separately for the 62 mothers of children who were eligible but who were not participating. The most frequently cited reason for non-participation in this group was that center enrollment was closed (18 mothers, 29.0 percent). If the non-participants who wanted to enroll but did not know how are added to this group, then 25 (38.7 percent) of the eligible non-participant mothers want to enroll their children but are unable to do so.

All results which are presented here are based on all non-participants in PFNS villages. It should be noted that the inclusion of ineligible mothers among non-participants does not contribute to an analysis of participant and non-participant differences. However, eleven of these mothers were only temporarily ineligible for the reasons of child too young (3) and child traveling and not in village (8). It is unlikely that the remaining ineligible non-participants were sufficiently characteristically different from the eligible non-participants to affect substantially the comparisons of participants and non-participants.

The non-participant mothers in PFNS villages reported that they had received other free food during the previous year (9.4 percent) somewhat but not significantly more frequently than the non-participant mothers from non-PFNS villages (5.4 percent) (Table 3, page A-3). The percentage of mothers receiving free food was generally low. The main source of this free food was the government of Senegal.

Table 4, page A-4, provides information on the ethnicity of families in PFNS and non-PFNS villages in relation to participation status. These figures suggest that although there do not appear to be large differences between participant and non-participant mothers in PFNS villages, there are large differences in ethnic composition of PFNS and non-PFNS villages. The percentages of Wolof mothers in PFNS and non-PFNS villages are 38.8 and 55.2 respectively ($p < 0.001$).

This observation may be associated with religious differences between PFNS and non-PFNS villages as indicated in Table 5, page A-5. All but 14 of the 1,338 mothers in non-PFNS villages stated that their religion was Muslim (99.0 percent), while the percentage of Muslims in PFNS villages was 85.2 percent ($p < 0.001$).

The data in Table 6, page A-6, indicate differences in socio-economic status (SES) between participants and non-participants in PFNS villages and between PFNS and non-PFNS villages. Over one-half of the participant mothers in PFNS villages (55.0 percent) lived in traditional or semi-traditional houses while only 39.4 percent of the non-participant mothers lived in such houses. The comparision of participants and non-participants did not achieve statistical significance ($X^2_3 = 6.05$, $p < 0.15$), but there was a trend for more participants to live in semi-traditional houses than non-participants, and for more non-participants than expected to live in modern houses. These trends were observed in the contributions to the chi-square test statistic. These data suggest significant differences between PFNS and non-PFNS villages for this indicator. Approximately three-quarters of the mothers from non-PFNS villages live in traditional or semi-traditional houses whereas one-half of the mothers in PFNS villages lived in these types of houses. Differences between PFNS and non-PFNS villages were compared using a 2 X 4 contingency table. These villages were found to be very different ($X^2_3 = 74.67$, $p < 0.001$) and the major contributions to the Chi-square statistic were from the higher numbers of modern and semi-modern houses in PFNS villages than expected.

Table 7, page A-7, presents the marital status of all mothers in PFNS and non-PFNS villages. Nearly all mothers were married at the time of interview (96.3 percent).

All mothers were asked if they had attended a French school. Since this criteria is related to SES, it can be said that the results are consistent with those for house type in that non-participant mothers in PFNS villages were somewhat but not significantly more likely than participant mothers to have attended French school ($X^2_1 = 1.46$, $p > 0.10$). These results further confirm apparent differences in the SES profiles of PFNS and non-PFNS villages. The percentage of mothers in PFNS villages who had attended French schools (14.5 percent) was more than four times as great as for mothers of non-PFNS villages (2.8 percent) (Table 8, page A-8). This highly significant ($X^2_1 = 72.19$, $p << 0.001$) result may be due in part to the religious differences cited in Table 5.

Table 9, page A-9, provides the results for the mothers' ability to read French. Although the differences between participant and non-participant mothers in PFNS villages are not as striking as in the previous table, significant differences between mothers in PFNS and non-PFNS villages are again observed ($X^2_1 = 41.15$, $p << 0.001$).

The results pertaining to husbands' education are displayed in Table 10, page A-10. There are no striking differences between husbands of participant and husbands of non-participant mothers in PFNS villages, but the small differences in the "never attended" category are consistent with the socio-economic findings. In addition, the husbands of mothers from non-PFNS villages were much less likely to have attended any school (91.6

percent) compared to the husbands of mothers in PFNS villages (76.5 percent). This difference in PFNS and non-PFNS villages is also highly statistically significant (X^2_1 = 55.75, p << 0.001).

Husband's principal occupation is also not strikingly different for participant and non-participant mothers in PFNS villages, but the results presented in Table 11, page A-11, are consistent with observed significant differences between families from PFNS and non-PFNS villages. Husband's occupation was reported as cultivateur by 66.0 percent of the mothers in PFNS villages and by 83.8 percent of the mothers from non-PFNS villages (X^2_1 = 48.59, p << 0.001). In addition, the percentage of husbands listed as cultivateurs in the PFNS villages is slightly higher for husbands of participant mothers (68.6 percent) than for husbands of non-participant mothers (56.1 percent).

b. Information on Mothers Pregnancy History

There are no noteworthy differences either between the age distributions of mothers in PFNS and non-PFNS villages or between participant and non-participant mothers in PFNS villages, Table 12, page A-12. These similar age distributions are not consistent with the results provided in Table 13, page A-13. Only 18.8 percent of the participant mothers in PFNS villages reported having had fewer than three live births while 42.3 percent of the non-participant mothers reported only one or two live births (X^2_1 = 15.48, p < 0.001). Participant mothers reported an average of 4.96 live births compared to 3.63 for non-participant mothers.

The participant mothers reported a total of 206 deaths among their 883 live born children and the non-participant mothers reported 74 deaths among their 287 live-born children. The numbers of children who had died are presented in Table 14, page A-14, for all mothers by participation status and on the basis of whether or not they lived in a PFNS village. (Mortality results are examined in more detail later in this section.)

The age distributions of the mothers' youngest child are provided in Table 15, page A-15. The important feature of these results is that the non-participant mothers in PFNS villages had somewhat more children under 1 year of age. In accordance with program policy, children are not allowed to enter a PFNS feeding center until they are 6 months old. Therefore, new mothers with children under this age would not have been eligible to be classified as participant mothers at the time of the survey. This observation may explain the small difference in the age distributions of youngest children of participant and non-participant mothers. It can be seen that after two years of age, the percentages are similar.

Slightly over one-half of both participant and non-participant mothers in PFNS villages reported having attended a clinic or health center for a prenatal visit during their last pregnancy. Only slight differences are observed between PFNS participants and non-participants. These results are presented in Table 16, page A-16.

At the time of the survey only about one-quarter of the mothers in non-PFNS villages and approximately 40 percent of mothers from PFNS villages had made post-natal visits during their last pregnancy (X^2_1 = 19.90, p << 0.001,

Table 17, page A-17). For both PFNS and non-PFNS villages, the participant mothers were more likely to have come to the clinic or health center for a post-natal visit for their last pregnancy than were non-participant mothers ($p = 0.10$ and $p < 0.005$, respectively). It should be noted that the percentages of mothers who reported having had post-natal visits for their last pregnancy were, in all cases, smaller than the comparable percentages for pre-natal visits — regardless of type of village or participant status. However, the percentage of decrease for post-natal visits was less for those who belonged to the PFNS feeding program. While this may reflect participation in a PFNS center, it may also be attributable to the fact that the non-participant mothers have more children under 6 months of age and therefore had less time than the participant mothers to bring their children in for post-natal visits.

The frequency and percentage distributions for the age at which the youngest child was weaned are presented in Table 18, page A-18. There are no significant differences in these results suggesting that the participant mothers in PFNS villages had weaned their last weaned child earlier or later than non-participant mothers ($X^2_1 = 0.55$, $p >> 0.10$).

Table 19, page A-19, provides frequency and percentage distributions for the age at which youngest children were first fed solid food. Approximately two-thirds of the mothers in all groups reported having given these children solid food prior to six months of age.

c. Immunization and Education Impact

Because diarrheal diseases are known to have a large influence on nutritional status of the younger children of less developed countries, all mothers were asked if their youngest child had had diarrhea in the previous two weeks. Response results for this question are presented in Table 20, page A-20. The striking finding indicated for these figures is that almost one-half of the mothers reported that their youngest child had had diarrhea during the two weeks prior to the survey, and it should be noted that this survey did not take place during the months of highest diarrhea incidence. The diarrhea rates for participant and non-participant children were not significantly different ($X^2_1 = 0.43$, $p >> 0.001$).

All mothers whose youngest child had diarrhea in the 2 weeks prior to the survey were asked how the child had been treated. Table 21, page A-21, provides the frequency and percentage distributions for the responses to this question. There are some important and striking findings in the responses to this particular question. From the initial field study of 17 center directors, it is known that pain de singe is recommended as a treatment for diarrhea, and these results indicate that this mode of treatment is used more frequently by participant mothers than by non-participant mothers. Non-participant mothers were generally much more likely to have used no treatment at all as compared to participant mothers. Perhaps one of the most important findings of this part of this study is the overall high percentage of mothers (51.3 percent) who used medication in the treatment of diarrhea among their youngest child whereas oral rehydration was used in only 1.3 percent.

All of these mothers were asked if nivaquine (chloroquine) was used either prophylactically, or as treatment for malaria with their youngest child during the previous winter months. Overall, nearly 80 percent of the mothers reported that their youngest child had had a fever some time during the previous winter. The results of Table 22, page A-22, indicate a trend that relatively more participant mothers living in PPNS villages used nivaquine when their youngest child had a fever than did non-participant mothers in these villages ($X^2_1 = 3.56$, $p < 0.10$). Also, among the mothers in PPNS villages who reported their youngest child not having had a fever episode the previous winter, participant mothers were somewhat more likely to have administered preventive nivaquine to the child than were nonparticipant mothers. However, this result was not statistically significant ($X^2_1 = 2.45$, $p > 0.10$).

The number of DPT/Polio immunizations for the youngest child are presented in Table 23. There are no significant differences in the percentages of participant and non-participant children in PPNS villages immunized for DPT/polio ($X^2_1 = 1.07$, $p >> 0.10$), but a higher percentage (10.1) of children in PPNS villages than non-PPNS villages (4.2) were immunized ($X^2_1 = 14.97$, $p < 0.001$). Overall, the percentages of children completing series of DPT/polio immunizations were very low.

Table 24, page A-24, indicates BCG vaccination status for the youngest children of the four groups of mothers. Fewer than one in ten of the youngest children of all mothers had received a BCG vaccination. BCG vaccination rates were slightly but not significantly higher ($X^2_1 = 0.67$, $p >> 0.10$), however, for youngest children of participant mothers. The percentage of youngest children with BCG vaccinations in PPNS villages (11.6) percent) was significantly ($X^2_1 = 10.31$, $p < 0.005$) higher than among youngest children in non-PPNS villages (6.0 percent).

Participant mothers in PPNS villages were nearly significantly ($X^2_1 = 3.20$, $p < 0.10$) more likely to have had their youngest children vaccinated against measles than were non-participant mothers. These results are presented in Table 25, page A-25. The vaccination rate for this disease (25.3 percent) was also significantly higher ($X^2_1 = 5.75$, $p < 0.05$) in children in PPNS villages than among children in non-PPNS villages (18.8 percent).

Tables 1-25, referred to above, describe results based on mothers and their youngest children. Subsequent to Tables, 26-32, provide selected results for all of the children of the mothers interviewed (including the youngest child). These tables provide results which are consistent with those based on the youngest child. The tables define categories of children participating (presently or previously), those non-participating and those with no knowledge of the program in non-PPNS villages within 1-4 kilometers and those villages within 5-30 kilometers of a PPNS center. These selected tables give results for age, incidence rates of diarrhea during the previous two weeks, treatment of diarrhea, malaria treatment, number of DPT/Polio vaccinations, BCG vaccination status, and measles vaccination status for all children. The results are consistent with the results presented above based on the youngest child.

d. Prevalence of Diarrhea

The total frequency (sample size) and weighted percentage of children having diarrhea at sometime during the two weeks prior to the survey interview are presented in Table 33, page A-33, by age, for selected participation status categories. It should be recognized that sample sizes for some cells of this table are small, i.e., fewer than 20 children, and therefore of questionable interpretability. Nonetheless, it can be observed in these results that there are no obvious consistent differences or trends among participant categories across age strata. However, for all participation categories in this table, the diarrhea prevalence rates are relatively high among children under two years of age, and these rates generally decline with age.

A closer examination of the relation between diarrhea prevalence and age indicates that prevalence is relatively low among very young children, i.e., less than 3 months, reaches a maximum among children 6-8 months old, slightly in excess of 60 percent, and declines very gradually until approximately two years of age when decline in incidence with age is more dramatic. These findings are displayed in Table 34, page A-34, for children in PPNS and non-PPNS villages and for all children. Taking consideration of sample sizes, there are no noteworthy differences in diarrhea prevalence between children in PPNS and non-PPNS villages. However, the general pattern of diarrhea prevalence with age is seen in both PPNS and non-PPNS village children. These data suggest that the most vulnerable ages are 6-12 months, but the most striking feature must be that more than one-half of the children (over 55.1 percent) in each of the age groups in the range of 3-23 months had diarrhea in the two weeks prior to interview.

The prevalence of diarrhea among children does not appear to be related to the type of house in which they live. However, it can be observed in the findings presented in Table 35, page A-35, that children living in traditional houses have somewhat lower diarrhea prevalence rates for the first three years of life. For four and five year old children, there are increasingly higher recent diarrhea prevalence rates in concert with an increasingly more traditional house type.

Although the patterns of diarrhea prevalence by age are similar for male and female children, there exist remarkable differences between the two sexes. The sample sizes and weighted diarrhea prevalence rates by age are provided for the two sexes in Table 36, page A-36. Male children had consistently higher diarrhea prevalence rates than female children for all ten age groups. These differences were most pronounced for 6-8, 9-11, and 12-18 months of age. There were only very small differences in diarrhea prevalence rates between the two sexes for children under three months of age or in the age groups over 35 months.

e. Anthropometrically Determined Nutritional Status

Summary statistics are presented in Table 37, page A-37, for the percentage of malnourished children by age and sex for the five anthropometric measures of nutritional status, i.e., weight for age, weight for height, height for age, arm circumference for age, and arm circumference for height. These statistics consist of the sample sizes and observed percentages of

malnourished children. (Children less than 70 percent of reference for weight for age are defined as malnourished in this report. The empirical definitions of malnutrition for the other four anthropometric measures are discussed later in this text and in Appendix C of this report.)

All of these anthropometric measures are interrelated to some degree (see Appendix C for a more rigorous treatment of this topic), and therefore, it is not surprising that the results of Table 37 are so similar for the five measures. The pattern of prevalence of malnutrition which emerges from these results is similar for both sexes. Furthermore, this pattern can be observed for all of the anthropometric measures. The general pattern is for malnutrition rates in these children to be low (generally 0-5 percent) for the first six months of age, to increase rather sharply at approximately 6-8 months of age (to 5-20 percent) and to remain elevated (15-25 percent) until approximately three years of age when the rates decrease (to approximately 4-8 percent).

All of the anthropometric measures except height for age present this pattern. The prevalence of malnutrition as determined by height for age remains low (0-5 percent) until 18 months of age when it increases to approximately 20 percent for both sexes. The prevalence of malnutrition defined for this measure remains higher than those of the other measures at higher ages, i.e., over 3 years. This is probably because growth slows between 1 and 2 years of age. When growth velocity returns to normal at about 3 years of age, the child is now in a lower growth channel and remains smaller in height/age relative to reference level (i.e., stunted) even though growth velocity may be normal.

One of the major areas of inquiry of this study involves the evaluation of anthropometrically measured nutritional status between participants and non-participants. In Table 38A, page A-38, the categories of participation are again stratified by distance to a PFNS. This table displays sample sizes and weighted percentages below 70 percent of reference for weight for age. These data do not provide evidence of striking or consistent differences between participants and non-participants. The overall difference in percentages of malnourished children between participants and non-participants is very small. The most noteworthy and consistent finding in the results of Table 38A is that relatively fewer participants and non-participants in PFNS villages are malnourished compared to their counterparts in non-PFNS villages. Additionally, this observation holds within nearly all age strata. The results of Table 38A are generally consistent with those of Table 38B, page A-39 for weight for height percent of reference.

The differences between participants and non-participants in PFNS villages were statistically tested while controlling for age employing the Mantel-Haenszel test for the data presented in Table 39, page A-40. The conclusion which was drawn based on the application of the test to these data is that lack of participation does not appear to be associated with malnutrition as defined by weight for age percent of reference category. This result is not surprising given that the small socio-economic differences between the two groups and not controlling for length of time in program of participants is not considered.

f. Nutritional Status and Prevalence of Diarrhea

For the purpose of this analysis of Part 1 data, malnutrition was empirically defined for the remaining four anthropometric measures based on the observed cumulative distribution of weight for age for all children. This was accomplished by determining corresponding points of the cumulative distributions of percent of reference for each of the four anthropometric measures which corresponded to the cumulative percentage for less than 70 percent of reference for weight for age. These percent of median definitions are provided in Table 40, page A-41. This table presents the prevalence rates among all children for recent diarrhea by age for nutritional status categories defined for each of the five anthropometric measures.

The results of Table 40 are perhaps the most "frappant" of the findings of this study. Simply stated, with very few exceptions, the diarrhea prevalence rates are higher across all age groups among children defined as malnourished regardless of the choice of anthropometric measure used to define malnutrition. There are 30 pairs of diarrhea prevalence rates presented for the various anthropometric measures and age groups of this table. In 24 of these 30 pairs of rates, the prevalence of diarrhea is higher in the "malnourished" group than in the "normal" group. In addition, the diarrhea prevalence rates in the former group are often substantially higher than the prevalence rates in the normal group. Finally, it is also worthwhile to note that in three of the six cases where the diarrhea prevalence rates in the normal category exceeded those in the malnourished, the sample sizes of the latter group were 4, 6, and 9, the smallest in this table.

g. Multivariate determinants of Nutritional Status and Diarrhea

Stepwise discriminant analyses were performed to ascertain if any characteristics of the participants and non-participants children in PFNS villages might be associated with recent diarrhea or nutritional status dichotomies defined for each of the five anthropometric measures. The variables from which predictor variables were chosen for inclusion in the discriminant function were sex, birth order, age in months, length of time in program (zero for non-participants), recent diarrhea, mother's age, French literacy, religious category and type of house. The cutpoints were to establish the nutritional status classification groups were as defined in Table 40 and explained in Appendix C. The significance level for variables to enter or be removed from the discriminant equation was 0.05.

The results of these discriminant analyses are presented in Table 41, page A-42. Age of child and religion of mother were found to be significant in the prediction of recent diarrhea in the children. No variables were consistently significant in predicting nutritional status categories as defined by the anthropometric measures. No variables were significant at the five percent level in predicting weight for age nutritional category. Sex of child was significant in predicting malnutrition of the child defined by arm circumference for age and height and age of child was related at the five percent level to height for age and arm circumference for height nutritional categories. Time in program was found to be significant for predicting malnutrition of children based on arm circumference for height.

The categories used to define nutritional status for the five anthropometric measures are based on the child's percent of median relative to standard. This statistical measure is clearly age related (especially as can be seen by comparing percent median scores across ages for a fixed z-score during the first year of life.) A child's z-scores for a particular anthropometric measure is a much more attractive statistic for analytic purposes. Consequently, multiple regression analyses were performed to examine how various characteristics of participant and non-participant children in PFNS villages might be linearly related with anthropometric z-scores (Table 42, page A-43). The pool of independent variables were as for the discriminant analyses except for the addition of the square of the child's age and recent diarrhea. (Square of child's age was added to control for the non-linear association between age and nutritional status.) The significance level for independent variables to enter or be removed from the regression equation was 0.05.

No variables were found to be linearly related to weight for height z-score at the five percent level. Age or its square, or both, were significantly associated with a child's z-score for the remaining anthropometric measures. Further reinforcing earlier findings among these results is the fact that recent diarrhea was significantly related to both weight for age and height for age z-scores among this group of children.

h. Trends in Mortality

The survey questionnaire which was administered to the mothers in Sine-Saloum included questions on the deaths of children. This information

was used in conjunction with the data for living children to construct data amenable to computerized life table analysis. This method has been employed because it makes the most efficient use of available data. Selected statistics from these analyses are presented in Tables 43 and 44. It can be seen in Table 43, page A-44 that the numbers of children and deaths among children in each participation group are moderate except for children of mothers in PFNS villages who had no knowledge of the program. This table provides the number of children on whom the life table statistics are based by participation category. The number of children is only 50 (with 8 deaths) for the aforementioned group and ranges up to 1,239 children (and 166 deaths) for the children of mothers in non-PFNS villages who had heard of the program but did not participate.

The estimated probability of survival to the beginning of each age interval is included in this table for each participation category. For example, the estimated probabilities of survival to two years of age (24 months) are respectively 0.9386 and 0.8729 for participant and non-participants in PFNS villages. The null hypothesis of the equivalence of the survival curves for participants and non-participants in PFNS villages was evaluated through examination of two test statistics produced by the BMDP life table program. Both of these test statistics show a trend for increased survival among participants but neither was statistically significant at the 5% level. (For the generalized Wilcoxon, $p = 0.178$ and for the generalized Savage $p = 0.065$).

These results indicate that participants in PFNS villages experienced lower 5-year mortality rates than any of the other participation groups and that the group with the most similar cumulative survival was the participants in non-PFNS villages. The cumulative survival was higher among program participants in PFNS villages for virtually all age intervals than for any of the other groups.

Another means of comparing the mortality experience of these groups is by comparing the age-specific mortality rates. These ratios were calculated using the participants in the PFNS villages for the denominator rates. Therefore, ratios greater than one represent higher age-specific mortality in the group being compared to the participants in PFNS villages. It might be noted that the mortality ratios for the non-participants in PFNS villages can be considered equivalent to relatives risks of non-participation.

In Table 44, page A-45, the mortality ratios have been defined relative to participants in PFNS villages. The age-specific mortality rates in this table are generally highest among 2-3 year old children. The exception to this observation is for non-participant children in PFNS villages whose mortality rate for this year of age was 1.8 percent. All other groups had mortality rates of 4.4 to 8.3 percent for this age interval. Because of the small numbers of children, one additional death among these non-participant children in PFNS villages in this age group would have resulted in an age-specific mortality rate in approximately this range.

The most important finding among these results is that the mortality ratios are highest for the non-participants in PFNS villages for age intervals from 6 to 24 months. These results suggest that the program has its maximum impact on mortality among children at these ages.

It is also noteworthy that the only group represented in this table for whom the mortality ratios are in the neighborhood of 1.0 across age strata is the program participants in non-PPNS villages.

The mortality ratios are highest for the non-participants who had never heard of the program. This is especially true for villages where there was a PPNS program. This is as expected and can probably be explained in part by the lower socio- economic level of this group. The most important comparison statistics are the mortality ratios for the non-participants who lived in the PPNS villages and who had heard of the program. Nearly 40% of this group did not participate because of inability to get into the program either because it was closed or because they did not know how to enroll. These children had a relative risk of over 4 in the most sensitive age groups. As we have seen, this group appears to be from the same socio-economic level as the participants.

A caveat must be inserted at this point to assist the interpretation of these observed mortality trends. The non-participants in PPNS villages include some mothers who were ineligible for participation because of reasons related to their childrens' mortality, i.e. child died too soon (seven mothers) and child too old (sixteen mothers). Thus two different selection biases have operated to contribute mothers to the non-participant group. The validity of the results of Table 2 of this part is also subject to question as these responses for non-participation were based on an open-ended question. Furthermore, there were only four deaths among non-participant children under six months of age, and if the data of Table 2 were accurate, then at least seven deaths in these age intervals would be expected in the mortality results.

These two selection biases each affect the results in a different direction, i.e., the former would decrease while the latter would increase the apparent survival. It is not possible to predict the net effect of these biases from these results, but these observed trends are still considered important by the evaluation team because they are consistent with much of the other evidence such as trends toward increased utilization of health care of participants and the fact that the trends toward higher mortality among non-participant children are manifested in the most vulnerable ages, i.e. 6-24 months, as would be expected.

B. PART 2

1. Methods

a. Sample and Procedures

Master charts were obtained from CRS Dakar for all centers currently operating in Senegal. These charts contain monthly information on the distribution of children in each size category according to percent of the Harvard Standard for each center. These categories are: less than 60, 60-64, 65-69, 70-74, 75-79, 80-84, 85-89, 90-94, 95-99, and more than 100 percent of reference for weight for age. This information has been obtained on a monthly basis from each feeding center since April 1981 as a part of CRS/Dakar's record keeping and surveillance system.

CRS/Dakar also routinely obtains information on the amounts and kinds of foods individual centers distribute each month. This information on monthly food distribution was added to each center's master charts. All master charts were photocopied in Dakar and sent to the Western Consortium in San Francisco for coding, key punching, and computer analysis.

One focus of the examination of the Part 2 data was to determine the effects of food disruption in early 1982 on the average nutritional status of children attending these centers. All master charts were reviewed to determine if they met study inclusion criteria which had been established to insure completeness and reliability of information. For the purposes of these specific analyses, the criteria were:

(1) No more than 2 months of missing data for food distributed during June-October 1981.*

(2) No missing data for either food distribution or attendance for November 1981 through June 1982.

A total of 151 centers met these criteria.** The master charts from Thies were not received in time to be included.

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* These criteria were relaxed for centers from Louga to allow that region to be represented.

** Prior to the evaluation team's work in Senegal during Phase II, there were 157 centers included in this analysis. However, a review of all charts from these centers by Sister Fredericka of CRS/Dakar indicated that six centers should be dropped and that data for some months (between 1 and 3) for nine centers should be omitted from these analyses. All results concerning the food distribution rupture are based on these centers, whereas all other results are based on 423 centers. There were a total of 437 master charts received and fourteen of these were found to contain highly suspicious or improbable data and were thus eliminated from all analyses. There were a total of 29 from the remaining 423 centers for which at least some monthly data were deleted from all analyses.

Other examination of the Part 2 data included a survey of the regional differences in the nutritional status of Senegal as shown by the participants in the PPNS feeding program, seasonal effects on malnutrition rates, and the distribution of feeding centers.

b. Information Obtained

(1) Location of center. All centers were identified by region, department, and arrondissement.

(2) Milieu of center. Each center defined by CRS/Dakar as urban, semi-urban, or village. These categories correspond to populations of greater than 25,000, between 3,000 and 25,000, and fewer than 3,000 inhabitants, respectively.

(3) Food availability in area surrounding center. Each center was ranked according to food availability in the surrounding arrondissement. In this ranking system, a value of 0 meant that the center was located in an area of much less local food availability than those ranked 5. This ranking was performed by AID/Dakar based on information available on food production by arrondissement.

(4) Type of center. All centers were characterized according to type. This included dispensary, social center, religious center, maisons familiales, and Centre Expansion Rurale Communale (CER).

(5) Monthly Food Distribution by Center. As a part of its routine record keeping, CRS/Dakar receives a monthly activity report from each center. This report contains information on the number of children weighed and the amounts of each kind of food distributed each month. The amount of food distributed per child was calculated at CRS/Dakar. This information was added to the monthly master sheets before they were photocopied and sent to San Francisco for key entry.

For the purpose of these analyses, a month of food disruption in a center was defined as a month when no food was distributed. It should be recognized that this definition has obvious limitations due to the stretching of rations which occurred in some centers during the rupture period of January-May 1982.

(6) Nutritional status of center. A description of the methods used in monthly weighing and record-keeping in the center will be found in Appendix A. Master charts for the centers are sent to Dakar each month. These charts indicate the number of children in each percent of reference grouping for less than 60 to over 100+ in 5 percent intervals.

The percentage of children who were less than 80%, 70%, 65%, and 60% of reference for weight for age was calculated for each center for each month.

After an initial comparison of variability of the rate of small children per month per center using the percentage of children below 80% of reference compared to 70%, it was decided to use the 70% cut off for all analyses because these statistics demonstrated less variability.

2. Results - Part 2

These results refer to Part 2 tables found in Appendix A, page A-46 to page A-58.

The distribution of centers by region and type are included in Table 1, page A-46. Of the 151 centers whose master charts were used for the following results, 121 (or 80.1%) were dispensaries. Most of the centers were from the regions of Casamance (49 centers, 32.5 percent), Fleuve (40 centers, 26.5 percent), and Sine-Saloum (24 centers, 15.9 percent). The remaining 38 centers were uniformly distributed from other regions of Senegal. Using CRS information from Cathwel/Dakar, it was recognized that the regions of Casamance and Fleuve are over-represented in this group and that Senegal Oriental, Louga, and Cap-Vert are under-represented.

The distribution of centers by location and region is provided in Table 2, page A-47. Approximately two-thirds of the centers are located in villages (population less than 3,000) and one-quarter are in semi-urban areas (population greater than 3,000 but less than 25,000). Only 15 centers (9.9 percent) are located in urban areas (population greater than 25,000). All of the centers in Cap-Vert region were classified as urban. More than three-quarters of the centers in the regions of Casamance, Diourbel, and Fleuve are located in villages.

The distribution of centers by region and food availability rating for the surrounding arrondisement is included in Table 3, page A-48. Most of the centers had a food availability rating of four (46 centers, 30.5 percent) or five (60 centers, 39.7 percent). Only 11 centers, seven in the Casamance and four in Douga, had food availability ratings of one. There were no striking differences in food availability by region.

The distribution of centers by region and duration of food disruption is presented in Table 4, page A-49. A disruption in food distribution occurred during one or more months between January and May of 1982 in approximately two-thirds of the centers. This was defined as the "rupture" period. A majority of the centers (88 centers, or 58.3 percent) had a disruption of duration 1-3 months, and in only 14 centers (9.3 percent) the disruption lasted for four or five months.

The frequency and percentage distributions for duration of disruption of food distribution are provided by location of center in Table 5, page A-50. These results do not suggest that the presence of period of food disruption is related to the location of the centers. Similarly the distribution of centers by food availability rating and duration of food distribution disruption in Table 6, page A-51, is not suggestive of a relationship between these factors. Thus, the food disruption appears to have been randomly distributed and not related to region or location of center.

The average numbers of kilograms of various Title II foods distributed each month in each region are presented in Tables 7A-7B, pages A-52 to A-53, for 1981 and 1982 respectively. Each region experienced some degree of food distribution decrease for one or more of the months during the period January - May, 1982. These figures are based on available data from the 151 centers used in the analysis of the rupture.

These results are depicted graphically in Figure 5. Although some of these results are based on a small number of reporting centers, it is possible to draw some general conclusions. The effects of the food disruption can be seen in all regions as a decrease in the average number of kilograms of these commodities distributed during the rupture period. There are no obvious discernible patterns in these results which indicate that some regions consistently reported distributing more or less food than others, but there is large variation in all regions for the average amount of food distributed during the year, even after excluding the rupture period. The range of average kilograms reported as distributed (difference between maximum and minimum average) is at least 4 kilograms each month for these seven regions. These differences are occasionally as great as 10 kilograms. The authors were not able to validate the accuracy of these particular data and the number of centers reporting are often small, and it is therefore important to recognize that these results should be interpreted rather more qualitatively than quantitatively.

Seasonal variation in the percentage of children less than 70 percent of reference in centers can be examined in Tables 8A-8B, pages A-54 to A-55 by region, center type, location, and food availability for all centers in Senegal with usable data (n = 423). Table 8A contains the average percentage of children less than 70 percent of reference and the number of centers reporting for April - December of 1981 and Table 8B contains the comparable results for January - September of 1982. It should be noted that the number of centers used in the analysis is smaller during April 1981 and September and October of 1982 because of commencement of record keeping in 1981 and the timing of data collection in 1982.

Seasonal trends can be observed in the countrywide average percentage of children less than 70% of reference for all centers. The worst months for both years are September, October, and November with a high in October 1981 of 9.60 percent. The best months overall are February, March, and April. The lowest percentage of small children, 5.30 percent, was recorded in March 1982.

Striking regional differences are also seen in this table. The average percentage of children less than 70 percent of reference in Cap Vert is between 4.33% and 7.45% for 1981* and between 2.87% and 6.70% for 1982. However, for Diourbel, the average percentage of children less than 70 percent of reference is between 7.98% and 13.58% for 1981 and between 6.86% and 14.57% in 1982. These results suggest that the percentage of children less than 70 percent of reference for Cap-Vert centers is lower than for centers of any other region. Additionally, the percentages for Cap-Vert for 1981-82 appear to show less seasonal change that the centers in other regions of Senegal. It was also noted that the time of onset of the seasonal change in the percent of small children varies from region to region.

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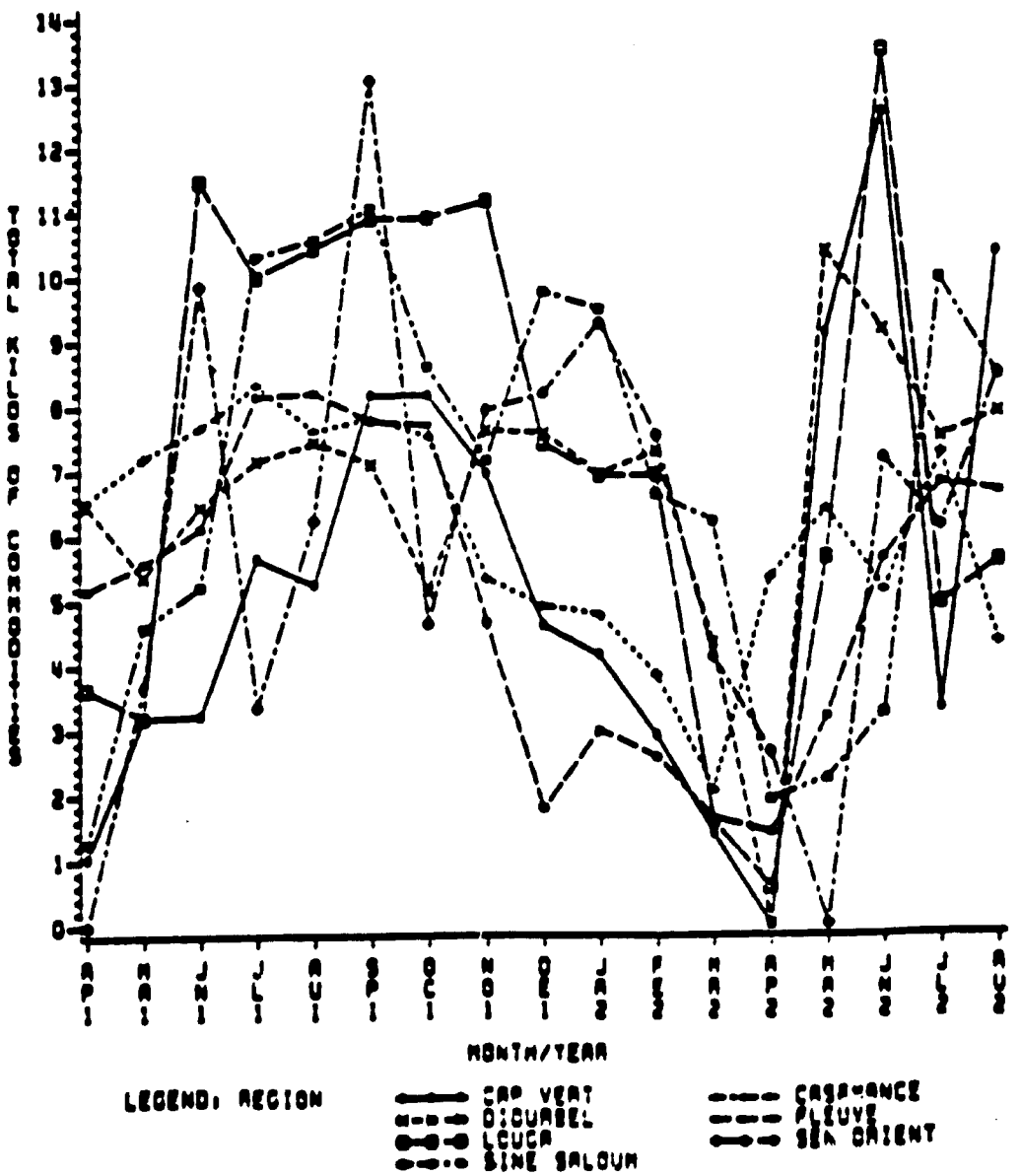
* The percentage of 9.02 for April of 1981 is based on only four centers reporting.

PART II - FIGURE 5
AVERAGE NUMBER OF TOTAL KILOGRAMS* OF VARIOUS COMMODITIES
DISTRIBUTED APRIL 1981 THROUGH AUGUST 1982



* MEAN NUMBER PER CHILD PER CENTER

Another striking feature revealed in this table is that urban centers (7 of 15 in the Cap-Vert region) also have generally lower percentages of children less than 70 percent of reference than either semi-urban or village centers. The changes seen in the percentages of children less than 70 percent of reference are similar during the year for semi-urban and village centers, but the percentages for semi-urban centers are consistently lower than for the village centers.

A graphical depiction of seasonal variation in the average percentage of children less than 80 and 70 percent of reference is provided in Figures 6 and 7 respectively for the eight regions of Senegal. Interestingly, these figures are similar in appearance. It should be noted that the percentage of children below 70 percent of reference falls within the range of 3 to 14 percent, and that the percentage below 80 percent of reference ranges from approximately 14 to 40 percent.

These figures also provide comparisons of the nutritional status of children attending centers in the different regions. Regardless of which standard of reference is employed (70 or 80%), it can be seen that generally far fewer children in the Cap Vert region fall below the percent of reference level and the opposite can be seen for the region of Diourbel. The percentages of small children are also generally higher for the region of Fleuve than for all other regions except Diourbel.

Seasonal patterns of average nutritional status are clearly indicated in these figures. The highest levels of small children were attained for virtually all regions during October of 1981, and the lowest levels during the months of January to April of 1982.

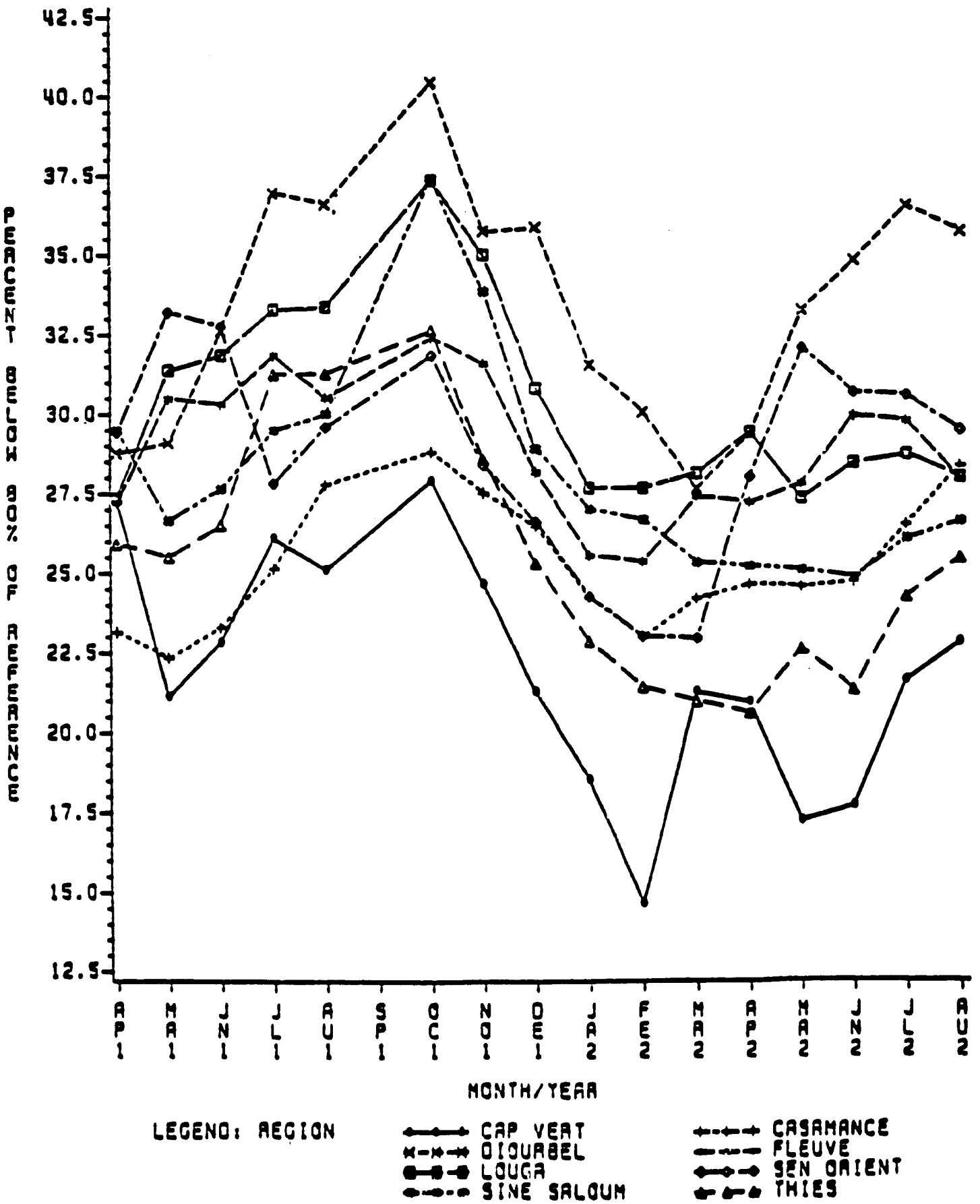
The impact of the disruption of food distribution on center attendance can be examined in Tables 9-10, pages A-56 to A-57. Table 9 provides the number of centers experiencing ruptures of varying length, and the average attendance for each center during December of 1981, and for the period of January - May 1982. The relative percentage change in attendance is the difference in average attendance between December 1981 and the average for the months of rupture divided by the December 1981 average.

For centers which did not experience an interruption of food distribution during the rupture period, there was very little change in average attendance. However, these results show that attendance in centers experiencing a disruption dropped during the rupture months and that this drop in average attendance generally increased according to the duration of the rupture.

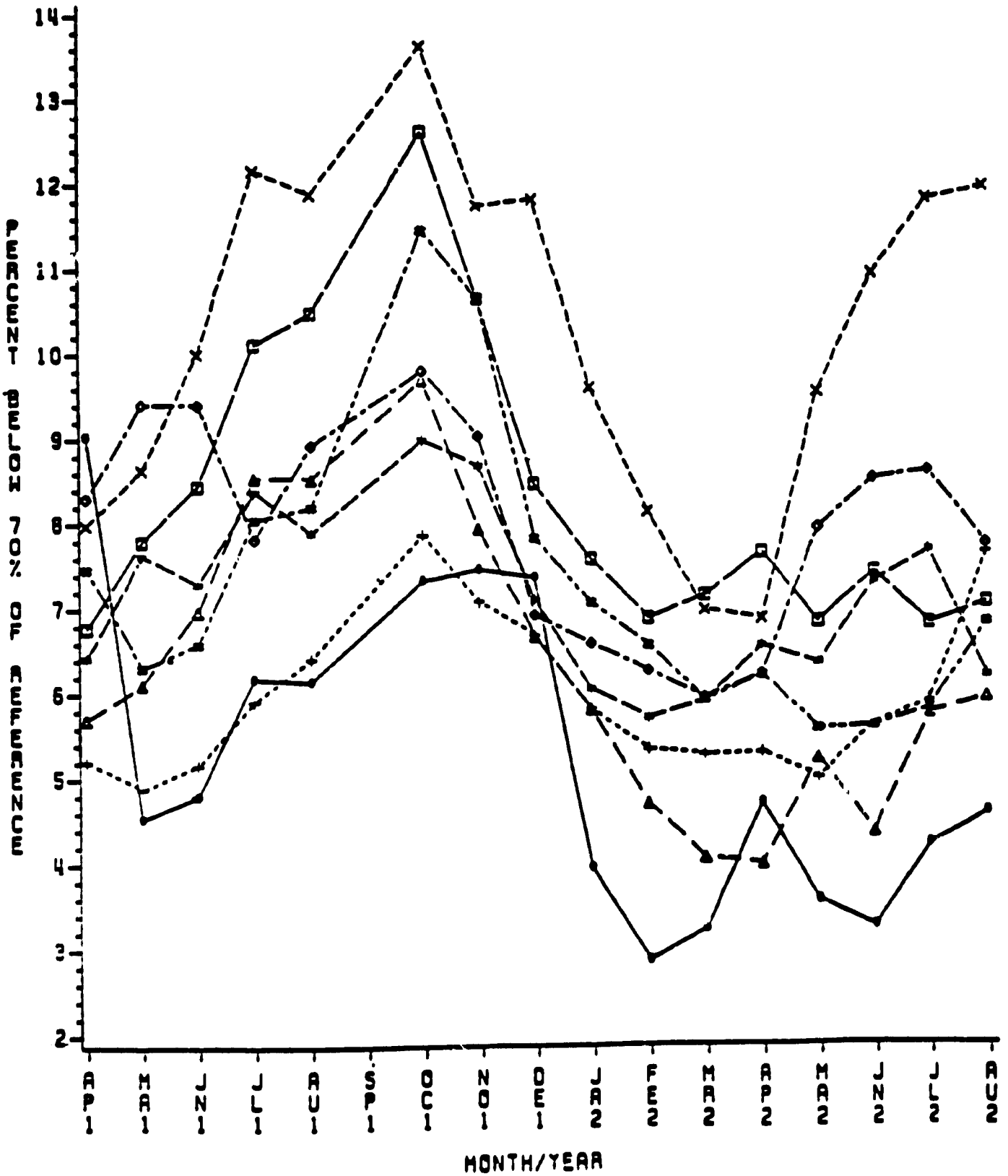
Table 10 is included to provide an examination of the possible impact of interruption of food distribution on center attendance in the month after the rupture period, i.e., June 1982. Average attendance for all centers is presented for December 1981 and for June 1982. Although average attendance was lower in June of 1982 than in December of 1981 for centers with a disruption of four months during the rupture period, these results provide no clear indication that long term center attendance was affected by the duration of food disruption. The effect of the disruption on attendance appears to have been short-termed.

The average percentages of children less than 70 percent of reference for weight for age in centers experiencing 0 to 5 months of rupture are presented in Table 11, page A-58, for June and December of 1981 and for June of 1982. There is no evidence in this table to suggest that the average percentages of children less than 70 percent of reference for weight for age in June of 1982 were affected by the rupture period.

PART II - FIGURE 6
AVERAGE PERCENTAGE OF CHILDREN IN EACH CENTER
LESS THAN 80 PERCENT OF REFERENCE FOR WEIGHT FOR AGE
APRIL 1981 TO AUGUST 1982



PART II - FIGURE 7
AVERAGE PERCENTAGE OF CHILDREN IN EACH CENTER
LESS THAN 70 PERCENT OF REFERENCE FOR WEIGHT FOR AGE
APRIL 1981 TO AUGUST 1982



C. Part 3

1. Methods

a. Sample and Procedures

The sampling frame for Part 3 consisted of 364 feeding centers that had operated continuously in Senegal for at least two years as of August 1982. Using implicit stratification by region and department, a systematic sample was drawn using a random starting point. Forty-five study centers were selected in this way.

Photocopies of the centers' registers containing the childrens' identification and growth data were sent to San Francisco for key entry, data editing, and analysis. Prior to key entry, each register was closely examined. If all growth data were not available from at least July 1981 through September 1982, the register was not included. Most registers contain data beginning in 1980, but at many centers the first month of available data is much later. In many cases this is due to the fact that the center started a new register because the old one was full. Since each child was given a new number and the names were all very similar, it would have been too time-consuming to try to match each child with his old record, and these old registers were not used.

The registers were examined for double entries and unique identification numbers were given to each child. One center's register was excluded due to the lack of unique identifiers for the children's recorded data.

Of the 45 centers, five did not have registers. Each was replaced with the center closest to it. Twenty of the 45 centers' registers met the selection criteria. However, four of these centers had not recorded sex of participants and therefore data for these centers were excluded from analyses involving sex or nutritional data.

The initial sample universe provided by CRS consisted of approximately 112,000 children in 364 centers. The sample of 45 centers contained 12,354 children. The 20 centers that had data had 7,961 children. Casamance and Diourbel were over-represented while the other regions of Senegal were under-represented, particularly Fleuve and Louga. These children comprise a random sample of all the children on whom usable data are currently available in Senegal; but as good recordkeeping may be associated with individual center characteristics and performance, these centers may not be representative of all centers in Senegal.

All information was key entered and verified by different operators and all inconsistencies were resolved. The resulting data were then analyzed at the University of California, Berkeley, Computer Center.

Most of the data editing procedures were performed with a special computer program which identified children with no weights recorded, children with missing or invalid birth dates or missing sex codes, and children with large weight changes between any two months. All errors identified were referred to the source documents and, where necessary, corrected.

b. Information Obtained on Each Child

(1) Date of Birth. The birth date of each child is entered in the register upon entry into the program. Frequently, many children enter on the same day and often from the same part of the village since the food distribution and weighings are often done by sub-groups. The concurrent entry of children from the same area serves as a natural check on the relative accuracy of the birth dates.

(2) Birth Rank. In all cases where a child's birth rank was indicated in the register, the information was keypunched for analysis. These data were available in only a few centers and not for all the children of those centers. Because of concerns regarding the accurate reporting of this variable, it was not included in any analyses.

(3) Sex. CRS/Dakar does not use sex-specific standards and it is therefore not necessary for them to obtain information on sex to plot the nutritional status of their children. Four of the 20 centers did not record the sex of any children. All of the other centers recorded sex, but there were some cases in which this information was missing. Since the CDC/WHO standards are sex-specific and therefore require sex to determine nutritional status, these cases could not be used in some analyses. Initial analyses were done separately for those centers which had records of participants' gender and for those which did not. For analyses in which the determination of sex was not necessary, such as age at entry into program, the data from all centers were combined.

(4) Nutritional Status. The methods used in weighing the children each month at the feeding center, and how the data are recorded in the registers, is detailed in Appendix B.

Nutritional status was computed monthly for each child using the computer program provided by CDC, Atlanta, that employs the CDC/NCHS standard. This program was used to provide nutritional status statistics for percent of median, percentile, and standard normal deviations from average (Z-score) of the reference population, on the basis of each child's monthly weight and age.

(5) Entry Date and Time in Program. The feeding centers in this study began keeping registers in 1980 and 1981. It was not possible to determine whether or not children who were present for the first month of a center's recorded data had been in the program or were entering the program that month. Therefore children were only designated as new program entrants on a center by center basis if their first recorded register entry was later than the date at which their center began keeping records. Time in program is therefore defined only for these new entrants and is the difference between entry date and any later date of interest. Only new entrants were used in the analyses involving entry date or time in program.

(6) Exit Data. The registers of some centers contained information on why program participants left the program. These data were keypunched when available. When the reason for leaving was given, it was usually coded in the register as one of the following: died, graduated, transferred,

or excluded. CRS/Dakar has a rule that if a child misses three sessions he/she is to be excluded from participation in the program. In our examination of the registers we found relatively few children who were allowed back into the program after having missed three sessions. We found that approximately ten percent of the children in the program had unrecorded weights for three or more consecutive months, but in very few of the cases (approximately two percent of all children) was this gap in recorded weights longer than five months. For the purpose of these analyses, dropouts are defined as those children who left the program and did not return during the period of study. (Another reason for doing this was to insure against mistaking the returning child for a new participant.)

Centers inconsistently recorded reasons for children leaving the program. In most centers, the percentage of children leaving the program, for whom a reason was listed was very small. In only one center, Gae, was this not true. In Gae, a high percentage of children who left were coded as to reason for leaving. In this center, it was possible to examine separately those children who graduated or transferred and those who were considered drop-outs.

2. Results, Part 3

The 45 centers for which registers were received are listed in Table 1, page A-59. This table describes each center according to whether or not its register was usable for longitudinal analysis and whether it contained the sex of enrolled children. There were 20 centers for which there were usable growth data. Of these 20 centers, 16 contained information as to the sex of the child and 4 did not. Also contained in this table are the starting dates at which the registers were begun for purposes of the study and the number of children from the centers whose data were entered in our analyses. (Most registers were begun before January 1980 but are noted as started in January 1980 for purposes of this study.)

Table 2, page A-61, shows there were 7,961 children for whom data were entered for analysis. Of these children, there were 1,592 from centers not recording sex of participants and the remaining 6,369 children were from the 16 centers which recorded the sex of participants. There were 4,245 children from all centers identified as having entered the program during the study period. Of these new entrants, 1,155 were identified as having either unknown age or sex.

There were a total of 3,090 new entrants identified among the 16 centers in which sex was recorded and for whom age at entry was known. For the four centers in which sex was not recorded, there were 634 new entrants for whom age was known. The frequency and percentage distributions for age at entry are provided by sex in Table 3, page A-62, for centers which recorded the sex of children and for both sexes combined for the centers which did not record sex of participants. Overall, 97.4 percent of the new entrants were enrolled under 3 years of age; and most of the children, 90.4 percent, were under 2 years of age at entry. The distribution of age at entry below 2 years is provided in a subsequent table.

The distributions for percentage of reference of weight for age for all new program entrants is provided in Table 4, page A-63, by sex for the 16 centers recording sex regularly. Most of the new entrants (91.7 percent) were above 70 percent of reference for weight for age at entry. Approximately one third of the new entrants were between 70 and 90 percent of reference for weight for age at entry. These data provide no indication of differential nutrition status at entry for the sexes.

Table 5, page A-64, provides numbers of new entrants and the percentage age distributions at entry by month for 1980-1982 for centers recording sex. For each of the three years, slightly over one-half of the new entrants were less than six months of age at entry. As noted earlier, very few children were allowed into the program after attaining 3 years of age. The only noteworthy finding in these results is that during 1980 when many centers began keeping registers, there were 11.1 percent of the new entrants between 2-3 years of age, and that this percentage drops in subsequent years. The percentages of children enrolled before their first birthday were relatively constant for this time period, i.e., 68.2 percent for 1980, 77.3 percent for 1981, and 73.3 percent for 1982.

The distribution of percent of reference for weight for age by month and year for all program entrants among the centers recording sex is presented in Table 6, page A-65. The distributions of children for weight for age are very similar for the three years except for very slight differences in the percentages of children between 60-69, 70-79, 80-89, and 90-100 percent of reference. The latter percentages drop slightly over this period from 62.9 percent for 1980 to 59.2 percent for 1981 and finally to 57.7 percent for 1982. During this same time the percentages of children 60-69 and 70-79 percent of reference at entry increase slightly.

The distributions for percent of reference for weight for age at entrance are provided by age at entry in Table 7, page A-66. These data provide striking evidence that nutritional status of children at entry into the program is related to age. For children entering the program under 6 months of age, only 3.9 percent were below 70 percent of reference at time of entry. This percentage increases for children entered between 6 and 11 months of age from 9.9 percent to 17.6 percent for children who entered between 12 and 17 months of age. The percentage of new entrants less than 70 percent of reference then slowly decreases by age group at entry for children aged 18-23 months, 13.8 percent; 24-35 months, 12.9 percent; to 11.6 percent for children entered at age 36-47 months.

These differences in distribution of nutritional status of new entrants by age could perhaps be explained by self-selection. Differences such as those seen in these age groups are, however, usually seen in the general populations of less developed countries. Based on this information from other countries, this shifting pattern of nutritional status of new entrants by age can be assumed to represent a phenomenon occurring in the general population of children in Senegal. The general population's nutritional status is relatively high after birth, followed by a rapid increase in percentages of children below 70 percent of reference at about six months of age. The low level of nutritional status for this cohort continues until about two to three years of age when the nutritional status of these children begins to improve.

In Table 8, page A-67, new entrants are described at entry by percentage distributions of age and percent of reference for weight for age for each of the 20 centers. It can be seen from these results that targeting by age is generally good for all centers. The only noteworthy exception to this observation is the center at Touba-Belele where nearly 14 percent of the new entrants during 1980-82 were over three years of age. This could be because of an outreach program that took in new subcenters at one time. In a number of centers including Camberene, Ziguinchor, Ndindy, St.-Louis, and Pambal, nearly all children (at least 97.0 percent) were under two years of age at entry.

Nutritional status at entry is related to age at entry as well as regional and seasonal factors. The centers at Faoune, Diamacouta, and Gae had the highest percentages of new entrants less than 70 percent of reference for weight for age (16.8 percent, 11.5 percent, and 10.2 percent respectively).

The percentages of new entrants relative to the number of children in the program are provided in Table 9, page A-68. These percentages are based on the centers with children of known sex and vary from month to month and year to year but are generally in the range of 4-7 percent each month.

The number of children leaving the program during 1980-82 are presented in Table 10, page A-69, by reported reason for leaving for each center. Overall in almost 60 percent of the cases, the reason for a child leaving the program was not noted in the centers' register. Thus for most centers these data cannot be used. The center at Gae was the only noteworthy exception. In this center, the reason for a child leaving the program was recorded for over 90 percent of the children. Approximately ten percent of the children recorded to have left the program at this center, were recorded as deceased, and approximately 60 percent of the children leaving were noted as "exclu" (i.e., dropouts, those who left the program but who did not die, graduate, or transfer.)

Table 11, page A-70, provides the percentage age distributions for children leaving the program at Gae during 1980-82 by reason for leaving. Overall 63.3 percent of these children were under 3 years of age when leaving the program. This percentage was slightly higher for deceased children, 79.2 percent, and almost 30 percent of all deceased children were between one and one-and-a-half- years of age.

The percentage distributions of weight for age percent of reference are provided for this same group of children in Table 12, page A-71. Approximately 10 percent of all children leaving were below 70 percent of reference of weight for age at the time they left the program. The most noteworthy finding in these results is that for deceased children, 23.8 percent were below 70 percent of reference and 61.9 percent were below 80 percent of reference the month before leaving the program.

Table 13, page A-72, provides the percentage distributions of percent of reference for weight for age by age group for all children leaving the program during 1980-82 for centers where the sex of the children was recorded. These distributions are remarkably similar to those for new program entrants at the time of entry (Table 7, page A-66) for all age groups.

The percentages of all children leaving the program by month and year are presented in Table 14, page A-73. These percentages are generally between 1-3 per month, somewhat less than the percentages of new entrants per month.

The percentage age distributions of children in the program for each month for the years 1980-82 is based on the ages of all children weighed each month during each year in centers where sex of children was recorded. Table 15, page A-74, provides the number of children weighed and the percentage age distributions for this time period. These age distributions strongly indicate aging of the group of children in the program.

Table 16, page A-75, provides the percentages of children less than 70 percent of reference for weight for age by age and season of the year. It should be noted that these results are based on all children's weighings during 1980-82, and hence a single child could have contributed multiple observations to the results in this table. The data for each year of this table were also inspected but were not included here because those results provide an essentially comparable description of seasonal results. The noteworthy result of this table is that the nutritional status of children in the program appears to be worst overall during the months of September - October, and that seasonal differences are observed in the younger children, (i.e., below 21 months of age).

The percentages of children less than 70 percent of reference for weight for age by age and time in program (as of July 1982) is given in Table 17, page A-76. There were very few children older than 50 months at this time, and the children present in July 1982 were uniformly distributed for time in program. Not surprisingly, the numbers of children weighed in the older age groups was higher for increasing time in program. There are generally large and consistent differences in the percent of children below 70 percent of reference for weight for age between children in the program for more than one year and those in for lesser amounts of time. These patterns are evident among the children under 33 months of age.

The rather consistent differences in percent of malnourished children in these three groups are graphically emphasized in Figure 8, page A-77. The percentages of malnourished children are lower for all age groups except 27-32 months among children in the program for more than one year compared to the two groups of children in the program for lesser amounts of time. The results shown in Table 17 and Figure 9 suggest that children in the program for longer amounts of time have overall better nutritional status. It should be noted that a selection bias related to age at entry (mothers more conscious of the health of their children enrolling them earlier) could to some extent account for these results. However, it is unlikely that this source of bias could account for these results (particularly in view of the Part 1 findings). Although these findings cannot be considered proof of nutritional impact of the program, they can be considered evidence which indicates nutritional impact.

The results of Table 18, page A-78 are based on all children who were less than 70 percent of reference for weight for age at the time of their entry into the feeding program. All these children were divided into cohorts based on their age at entry into the program. The classification by age at entry, i.e., less than 6 months, 6-11 months, 12-17 months, and over 18

months, provided a nearly uniform distribution of these children into cohorts. However, the numbers of children in each cohort are small, and the numbers of children available at follow-up intervals of more than 12 months in the program are small for all four cohorts.

These results should be interpreted with caution. It can be observed that these findings are consistent with a potential program effect on nutritional status. For example, the percentage of children remaining less than 70 percent of reference for weight for age for those children who entered the program at ages 6-11 months was 61.5 percent (n=39) at the time they had been in the program for 6 months (and at which time the age range of their cohort was 12-17 months.) Similarly, for those children in approximately the same age range, i.e., 13-18 months, who had entered the program at less than 6 months of age and who therefore had been in the program for 12 months, the percentage of the cohort remaining less than 70 percent of reference of weight for age was only 3.6 % (n = 19). Thus a lower percentage of children in the program for the longer time remained malnourished. This result is not consistent, however, because the percentages of children less than 70 percent of reference for weight for age are nearly the same for the cohort of children 6-11 months of age at entry at follow-up ages 18-23 months (12 months in program) and for the cohort entering the program at ages 12-17 months at follow-up ages 18-23 months (6 months in program).

It can also be seen that the percentage of children remaining less than 70 percent of reference generally decreases with time in program for the three cohorts entering the program at ages greater than 6 months. The time in program, however, is directly associated with age, which is known to affect nutritional status in the general population. Of the 43 children who had entered the program under 6 months of age and had been in the program for 3 months, only 27.9 percent (12 children) were below 70 percent of reference. This percentage drops at 6 months in the program (20.7 percent, n = 25), but then rises for those children weighed after being in the program for 9 months (45.5 percent, n = 22).

In addition to participation in the program, other factors which undoubtedly also account to some extent for the observed improvement of each cohort with time in program include aging, selection bias due to survivorship, and regression to the mean. (Recall that the results of this table are based on children less than 70 percent of reference at their time of entry into the program.)

The results shown in Table 18 were used to construct Figure 10, page A-79, which provides the percentages of children remaining malnourished for four lengths of time in program. This figure also suggests that children in the program for longer periods of time have generally higher nutritional status.

The results of Tables 19A and 19B, pages A-80 — A-81, are provided to describe the longitudinal experience of the cohort of children who entered the program at less than 6 months of age. All children included in these results have remained in the program, and hence follow-up age is directly related to time in program. For example, at follow-up age 9 months, all children in the cohort had been in the program 3-8 months.

The results of Table 19A are taken from Table 19B and are included to provide a simplified presentation of the follow-up percentage distributions of weight for age for all children entering the program less than seven months of age with a weight for age percent of reference of at least 80 percent. These data indicate that a percentage of the children of this cohort drop in nutritional level at 9 and 12 months months of age, remain approximately the same at 18 months of age, and then begin to improve at 24 months of age. Approximately 40 percent of this cohort shows a drop in nutritional level from entry at ages 12 and 18 months. It should also be noted that at least approximately 60 percent of the children maintain or regain their entry nutritional category at each follow-up age.

Table 19B provides results similar to Table 19A except that these results are for all children entering the program under seven months of age, and these children are divided (or stratified) into follow-up cohorts according to their nutritional category at entry. Thus the percentage of reference distributions for each of the four entry-level cohorts are provided at six follow-up ages.

The data for the total cohort suggest that the percentage of "small" children, i.e., those children defined as malnourished on the basis of their being less than 70 percent of reference for weight for age, rises with age until approximately 15 months of age before declining. This pattern is also seen for all four cohorts defined by entry nutritional level, but the peak percentage of small children occurs at different ages; and, as expected, the levels of percent of small children also differ across for the entry cohorts.

Except for the cohort of "small" children at entry, the levels of small children in the entry strata cohorts at the various follow-up ages are ordered according to their entry strata. That is, for example, the cohort consisting of all children less than 70 percent of reference at entry has the largest percentage of small children at almost all follow-up ages. Conversely, the cohort of children who were at least 90 percent of reference at entry has the smallest percentage of small children at all follow-up ages. The presentation of these entry cohorts' longitudinal nutritional status is also provided in Figure 11, page A-82.

The peak levels of small children are at follow-up age 12 months for children entering the program in the less than 70 and 70-79 percent of reference ranges, and are at 15 months for the two groups of children above these levels at entry. Similar patterns of nutritional status with age are generally seen in the general populations of developing countries.

Growth is the most sensitive indicator of nutritional status. In an effort to explore the impact of the program on growth, forward stepwise multiple regressions were performed to evaluate possible relationships between several independent variables and change in nutritional status (i.e., growth) between specified ages, i.e., 6 and 12 months, 12 and 18 months, 18 and 24 months, and 24 and 30 months. In each analysis the dependent variable was the weight for age Z-score as of the end of the interval. The independent variables consisted of weight for age Z-score at program entry, months of participation in program as of first age, weight for age Z-score as of first age, participation rate as of first age, and participation rate

as of second age. Since in all cases the first variable to enter the equation was weight/age Z-score at the beginning of the interval, the resulting variation remaining is due to the change in Z-score or growth. The significance level for variables to enter or be removed from the regression equation was 0.05. Descriptive statistics, i.e., sample means and standard deviations, are presented in Table 20, page A-83, for these independent variables for each regression.

Some noteworthy observations can be made for these data. The mean participation rates are all approximately 90 percent and all decrease over these age intervals. It should be noted that these mean participation rates are the cumulative mean participation rates since program entry. For example, the mean participation rate for all children of 30 months of age is 87.6 percent. The mean participation rates in this table are all higher than this figure for the younger ages. These figures probably are slightly biased because of the selection criterion that a child had to be present at both ages of the interval for inclusion, and actual program participation rates may indeed by somewhat lower than these figures. The mean weight for age Z-score decreases dramatically between ages 6 and 12 months and slightly between 12 and 18 months before increasing over the intervals at higher ages.

The results of these regression analyses are presented in Table 21, page A-84. In all four regressions, as anticipated, the weight for age Z-score at the first age of the interval was the first variable to enter the regression equation and accounted for between 45.7 percent of the total variation for the age interval 6-12 months to 66.0 percent for the age interval 24-30 months. Consequently, succeeding variables entering the regressions were those most highly related to change in nutritional status, i.e., growth. For the three higher age intervals, the next variable to enter was the weight for age Z-score at program entry. This consistent finding can perhaps be interpreted as suggesting that the weight for age Z-score at program entry is itself an indicator of potential future growth. However, although statistically significant in these three instances, this variable did not in any case increase the amount of variation explained by more than 2.4 percent. For the age interval 6-12 months, the other statistically significant variables in predicting nutritional status were sex and participation rates at ages 6 and 12 months. However, these three variables together accounted for only 1.9 percent variation.

Independent variables related to program participation were found to be significantly related to growth in the first two age intervals. For predicting changes in nutritional status between 6 and 12 months of age, program participation rates at 12 and 6 months were entered into the regression equation after sex. The contribution of these two variables together was approximately the same at that for sex, 1.0 percent. The number of months in program entered the regression equation for prediction of change in nutritional status for the 12-18 age interval. This variable explained 0.5 percent of the variation in weight for age Z-score at 18 months of age which was not explained by either weight for age Z-score at age 12 months or by weight for age Z-score at entry. No other independent variables were found to be related to short term changes in nutritional status for these age intervals.

Regression analyses were similarly performed employing weight (to tenths of a kilogram) as of the second age of the interval as the dependent variable. The independent variables for all four age intervals were weight at the first age of the interval, sex, months of participation in the program as of the first age, and the participation rates as of both ages of the interval.

The results of the four forward stepwise multiple regression analyses are provided in Table 22, page A-85. The range of percentages of variation explained was very similar to that observed in the previously described analyses, 51.1 percent to 65.0 percent. Here also the percentage of variation explained by the regression equations increases with increasing age intervals.

The first independent variable to be entered into regression equations was weight as of the first age, and this was the only variable which qualified to enter the regressions for the higher three age intervals. As before, the participation rate as of 12 months of age was significantly associated with weight change over the 6-12 months age interval. However, the contribution of this variable to the increase in explained variation was again small, 0.6 percent.

The results of these regression analyses can be briefly summarized. Relative growth, i.e. relative to a reference population, has been examined for four age intervals as it relates to various independent variables. Sex of child and participation rates were found to be significantly ($p < 0.05$) related to growth from 6 to 12 months of age. The number of months of program participation were significantly and directly related to growth from 12-18 months of age ($p < 0.05$). The nutritional status/weight for age z-score) at program entry was significantly related to growth (1 = C, $p < 0.05$) for age intervals 12-18, 12-24 and 24-30 months.

No variables except participation rate at 12 months of age ($p < 0.05$) were found to be significantly related to absolute growth (change in weight) for any of the four age intervals.

Comparison of Program Participants in the Sine Saloum Centers of Khoungheul and Mbar with Non-Participants in PPNS Villages from Part 1

The non-participants in PPNS villages from the Part 1 CDC survey of a random sample of children in Sine Saloum were chosen as the most appropriate reference population for evaluating the weight for age percent of reference results for the children in the Sine Saloum centers of Mbar and Khoungheul. The CDC survey was performed during the month of November, 1982. The registers for the centers of Khoungheul and Mbar were photocopied during that same month but prior to the weighing sessions, and the only available data in these centers for comparative purposes was for October of 1982. The seasonal trends presented for all centers in Senegal in Part 2 of this report indicate that the mean nutritional status levels were higher (lower percentage of children below 70 or 80 percent of reference) in November than in October of 1982 for the region of Sine Saloum. The comparison was performed with the hope that program participants might demonstrate higher nutritional status levels across age groups in spite of the difference in months favoring the non-participants and in spite of not selecting

participants based on some minimum time in program. The data are not sufficient to allow controlling for this factor.

The categorization of the Khoungheul and Mbar participants and the Sine Saloum non-participants by weight for age percent of reference category for age strata are presented in Table 23, page A-86. A cursory inspection of these results does not suggest any consistent differences between the participants and the selected reference group.

The first hypothesis to be tested for these data regards the consistency of the degree of association (of whatever magnitude) between weight for age percent of reference category and sample group across age strata. The statistical test of this hypothesis of homogeneity of association did not provide evidence to the contrary $X^2_6 = 12.16$, $p > 0.05$. Given that the degree of association is consistent across age strata, the second hypothesis to be tested requires the determination of whether or not the common degree of association is statistically significant. The overall degree of association is not significant ($X^2_1 = 0.42$, $p > 0.45$), and it is concluded that the comparison of these data provides no evidence of an association between weight for age percent of reference category and program participation.

It should be recognized that age is the only variable for which these two groups are adjusted for comparison. In addition to month of the year, there are perhaps other important factors related to child's nutritional status which are not comparable for these two groups, and consequently these results should be considered cautiously. This finding should not be interpreted as a lack of program impact on nutritional status of participants because confounding factors and length of time in program were not included in this analysis. A genuinely disturbing occurrence would be to have found that participants were of significantly lower nutritional status than non-participants.

D. Field Work

1. Questionnaire of 45 Center Chiefs and Regional Coordinators (Part III Field Work)

a. Methodology

Field site visits to the selected 45 centers and to regional coordinators were made by a three-member team composed of M. Diene, DANAS, Ministry of Health; Mme. D. Lo, DANAS, Ministry of Health; and Mme. Helen Munoz, local consultant to USAID/Senegal. The field work started on December 6, 1982 and was completed February 14, 1983 with a total of 26 days spent in the field.

In the original study design these field visits were planned to gather registers from the random sample of 45 centers and administer a questionnaire to the center chiefs which would characterize the centers. While this was being accomplished, the team thought that their time might be usefully spent posing some open-ended questions to center directors and to regional coordinators. These questions and answers were of particular interest to DANAS.

The purpose of this DANAS questionnaire was twofold: First, it generated support for the evaluation by offering program administrators the opportunity to present their views on the programs which they implement; additionally, it enabled the team to assess the constraints faced by the program administrators and to obtain suggestions for their solution. The open ended questions were posed during non-directive interview sessions and answers were noted without any comments. Regional coordinators and a few departmental coordinators were also interviewed using another questionnaire which contained similar basic elements (see below).

Thus, in addition to the basic preset questions, each chief of center was asked the following questions:

- In general, what do you think of the PPNS?
- Have you any criticism to make against the PPNS?
- Have you any suggestions for a better operation of the program at your level?
- What recommendations can you make to the higher authorities for the improvement of the program?
- Do you think that the PPNS has induced a positive change in the attitudes and behavior of mothers regarding the way they feed their children?
- Do you think that the PPNS has induced an improved nutritional status of the children?
- How would you assess your center?

- Do you have any questions to ask the evaluation team?

The evaluation design team from Washington had selected a random sample of forty-five (45) centers from a list of all the centers. Centers which were found to have been closed were substituted with the next center on the sample list. This was the case for:

- Diamaguene (Cap Vert) replaced by the Red Cross Center of Pikine;
- Malika (Cap Vert) replaced by the MCH Center of Rufisque;
- Mbalking (Thies) replaced by the Social Center of Mbour;
- Bani Israel (Eastern Senegal) replaced by Cotiary .

For Sinthior Fissa (Eastern Senegal), the chief of the center was not found at the post. Because of the distance and uncertainty about his date of return, Sinthior Fissa was replaced by the center of Bele (located 5 km. away).

In regard to the records, it should be noted that the register of the center of Nganda (Sine-Saloum) has not been received. According to the chief of the center, it was completely destroyed by his brother, who is mentally ill.

b. Results

Responses to the questionnaires for center chiefs, and regional coordinators, and an assessment of the quality of records were tabulated and analyzed. The results are provided in Appendix D, p. A-100.

Interim Findings of Visits to 45 Centers

From the results presented in Appendix D, some major conclusions were drawn by the DANAS team:

1. The good methodological and technical design of the program is mentioned by the majority of individuals interviewed even if it is noted that some activities are cumbersome.

2. The gap between design and implementation is strongly emphasized. This seems to result from the preeminence of foodstuffs over all other aspects of the program, constituting the main if not the sole motivation for the mothers to visit the center.

3. Another observed gap between design and implementation is the major concern with the controls of funds not only for the CRS agents in their supervision activities but also for the chiefs of centers themselves. In fact, the more or less intrinsic and repressive nature of the controls is often emphasized.

4. Yet another concern is the low priority given to technical issues, which is reflected in the lack of nutritional or in-service training

for most agents. The lack of demonstration materials or audiovisual aids to assist in nutritional and health education was also noted.

5. Despite the grievances raised, a great majority of individuals recognize that the program has a real impact on the improvement of the nutritional status of the children, this impact is attributed to the positive change the program brings about in the attitudes and behavior of mothers regarding the way they feed their children.

Results of the Qualitative Assessment of Registers of the 45 Centers

In this evaluation, the registers are the source of the longitudinal analysis of the growth of children enrolled in the PPNS for Part 3. Reliability and accuracy of the evaluation will largely depend on how well registers are maintained as well as the data they contain. Thus, it was necessary to assess them. This was done during the visits to 45 centers in January of 1983 by the DANAS team.

Sixty-eight (68) registers were reviewed in this manner. For some centers, two registers were collected. The register of the Pambal center was not seen and the 28 registers of the Koungheul center were reviewed only once.

For the general presentation, the cover and the content were examined; for the recording of data, legibility and consistency. Using the criteria shown below, these four variables were rated on three scales: good, fair or average, and bad.

For the cover:

- Good = clean and in good condition
- Fair = in good condition but dirty
- Bad = dirty and in bad condition

For the content:

- Good = clean and sheets undamaged
- Fair = undamaged but dirty sheets
- Bad = loose and dirty sheets

Legibility

- Good = letters and figures distinct on more than 6 out of 10 pages selected at random
- Average = letters and figures distinct on 5 out of 10 pages
- Bad = letters and figures distinct on less than 50 out of 10 pages

Consistency

(With regard to weight "consistency" is when the increase or decrease from one month to the other does not seem likely.)

- Good = no unlikely difference for 8 out of 10 children selected at random
- Average = no unlikely difference for 5 to 7 children
- Bad = no unlikely difference for less than 5 children

Results

	% Good	% Fair	% Bad
General presentation:			
Cover:	53	32	15
Content:	42	49	9
Recording of data:			
Legibility:	49	38	13
Consistency:	34	44	22

2. Characteristics of 45 Randomly Selected Centers

The information on the following tables provides an overview of all 45 centers that were randomly chosen for analysis of their growth records. At the time the registers were collected from the centers, a questionnaire was administered to each center director. The results of this questionnaire allow us to characterize the operations of centers as to the center directors' training, the centers' operations, other food distribution in the area, and the major causes of death among the children.

Center Directors

The directors of most of the centers are government nurses with three years' training. Most of them have worked in the centers for three years. Only slightly more than one-half of the center directors have had training in nutrition.

Centers

Most of the centers are government dispensaries. Others are run by the Red Cross, religious orders, and social groups. Many of the centers have sub-centers that are also used to serve their participants. The mothers come to either the sub-center or the main center as part of a group, either one morning or one afternoon per month. The average number of groups per center is 9.1, and the average number of mothers per group is 34. The average center serves 285 children. Many of the centers have helpers to aid the directors. Many of these helpers have been trained locally to be aides and assistants.

Most centers are located in medium population areas. The directors were asked to compare the revenue of the area with that of the participants. The average response was that the income of participants and non-participants was the same.

The directors were asked about other food distribution that might have reached the program participants. Many responded that there had been government food distribution in the area, but it had usually happened only one time and was less than 5 kg. per person.

It can be seen that the average number of deaths per center among children in the program was high. The cause mentioned most frequently by the directors was malaria, followed by measles and diarrhea. During discussions with center and regional directors, it was noted that the incidence of these diseases, especially diarrheal disease, increased during September and October.

FIGURE 8: CHARACTERISTICS OF 45 RANDOMLY SELECTED FEEDING CENTERS

Center	Center Directors				Center Characteristics						Pop. in Area	Max. Dist. (Km)	Income for Area	Other Foods Kg./ Child	Mortality of Children in Program		
	Basic Train.	Yrs. Trn.	Yrs. in Ctr.	Nutr. Trn.	Sub-Ctrs.	No. of Grps.	No. in Group	No. in Prog.	No. of Aides	Days Open/ Week					Deaths/ Year	1st Cause	2nd Cause
CAP VERT											*						
*Dispensaire de Camberene	Med. Tech.	2	4	No	0	10	35	200	4	2	3,000	1	Same	No	5	Diar.	Mala.
PMI Dufloque	Govt. Nurse	3	6	Yes	3	17	40	?	2	5	15,000	5	More	No	6	Mese.	Mala.
Croix Rouge Pikine	Mid-wife	3	1	No	3	8	25	?	5	3	2-2,500	2	Same	Bd.Cross Dec. '81 Mar. '82	11	Diar.	Mese.
CASAMANCE																	
*Dispensaire Munic. Ziguenc	Nurse	3	3	No	0	4	50	200	3	1	8,000	5	Same	Govt.'81 9.5 Kg.	10	Mala.	Mese.
*Dispensaire de Affiniam-Elana	Nurse	3	3	No	0	7	20	343	3	2	2,000	10	Same	Govt.'81 7 Kg.	1	Mese.	---
*Dispensaire de Sare Yoba	Med. Tech.	4	3	Yes	0	6	30	60	-	2	1,000	15	Same	Govt.'81 5 Kg.	6	Diar.	Resp.
*Dispensaire de Elinkine	Health Agent	2	1	No	4	8	30	140	-	1	1,500	9	Same	No	4	Mala.	Nare.
*Centre Social [illegible]	A.S.C.	1 day	2	No	4	11	30	450	3	4	500	40	Same	Govt.'81 5. Kg.	3	Diar.	Mala.
*Dispensaire n'Diamacouta	Govt. Nurse	3	3	No	2	10	45	125	-	3	3,000	9	Same	Govt.'81 10 Kg.	13	Mala.	Mala.
*Centre Social Ziguinchor	A.S.C.	4	4	No	0	8	35	850	-	2	700	5	Same	No	2	Diar.	---
*Dispensaire de Bissine	Govt. Nurse	3	2	Yes	0	5	40	400	1	1	400	?	Same	Govt. '81 & '82 10 Kg.	15	Mala.	Diar.

* Growth Register used in Part III analysis

FIGURE 8: CHARACTERISTICS OF 45 RANDOMLY SELECTED FEEDING CENTERS, continued

Center	Center Directors: Basic Train.	Yrs. Trn.	Yrs. in Ctr.	Nutr. Trn.	Center Characteristics: Sub-Ctrs.	No. of Grps.	No. in Group	No. in Prog.	No. of Aides	Days Open/ Week	Pop. in Area	Max. Dist. (Km.)	Income for Area	Other Foods: Kg./ Child	Mortality of Children in Program: Deaths/ Year	1st Cens.	2nd Cens.
DIOURBEL																	
Dispensaire de Keur Samba Kane	Govt. Nurse	3	1/6	Yes	0	24	30	380	4	1 per Month	4,000	8	--	No	1	Unk.	Unk.
*Dispensaire de N'Diady	Govt. Nurse	3	1/6	No	0	9	30	250	3	1 per Month	4,000	7	Some	No	12	Mean.	Male.
*Dispensaire de Touba Belele	Govt. Nurse	2	4	Yes	0	10	40	150	4	4	1,000	2	Less	Khalif	2	Mean.	Unk.
FLEUVE																	
Sous-Centre mCaye-mCaye	A.S.C.	7/12	1½	Yes	0	10	25	219	--	3	300	½	Some	Govt.'81 5 Kg.	4	Mean.	Male.
PMI de Sor	Mid-wife	3	4	Yes	0	8	25	150	1	1	5-7,000	1½	Less	No	10	Mean.	Male.
*Dispensaire de Goe	Mid-wife	3	1/6	Yes	1	8	48	540	5	2	2,000	2-3	--	Govt.'82 4.5Kg.	23	Male.	--
Dispensaire de Thiago	A.S.C.	1	1½	Yes	0	8	25	250	-	2	350	1	--	Govt.'82 4 Kg.	5	--	--
Dispensaire de Donette	Govt. Nurse	3	1/6	Yes	0	9	45	481	2	9	?	14	Some	?	?	--	--
Dispensaire de Thille Boubacar	Govt. Nurse	3	1/6	No	1	12	30	597	1	3	2,000	20	Some	Govt.'82 5 Kg.	18-20	Mean.	UnCom
*Dispensaire de Diamandou	Health Agent	2	1/12	No	0	5	?	200	1	1	?	10	?	?	3	Mean.	UnCom
Dispensaire de Bandou	Govt. Nurse	3	5	No	5	12	50	666	1	4	1,000	10	Some	Govt.'81 5 Kg.	10	Diar.	Male.
Dispensaire de Mawade	Govt. Nurse	3	4	No	1	7	50	527	-	3	1,000	10	Some	Govt.'80 3 Kg.	3	Male.	--
Dispensaire de Boyadel	Health Nurse	1	6	Yes	0	7	40	280	1	2	3,000	3	Some	No	0	--	--

* Growth Register used in Part III analysis

FIGURE 8 : CHARACTERISTICS OF 45 RANDOMLY SELECTED FEEDING CENTERS , continued

Center	Center Directors				Center Characteristics						Pop. in Area	Max. Dist. (Kms.)	Income for Area	Other Foods Kg./ Child	Mortality of Children in Program		
	Basic Train.	Yrs. Tra.	Yrs. in Ctr.	Nutr. Tra.	Sub-Ctrs.	No. of Grps.	No. in Group	No. in Prog.	No. of Aides	Days Open/ Week					Deaths/ Year	1st Cause	2nd Cause
LOUGA																	
Dispensaire de Vallegora	Health Aide	2	2½	No	0	4	35	175	3	--	9 000	15	Less	Govt.'82 ?	3	Mala.	Mens.
Dispensaire de Sakal	Nurse	3	6	Yes	0	16	25	287	4	2	600	5	--	Govt.'82 ?	?	Mens.	Diar.
SENEGAL-ORIENTAL																	
Dispensaire de Fongolemby	Govt. Nurse	3	1	Yes	0	7	30	50	1	2	500	7	Same	Govt.'82	10	Diar	Mens.
Dispensaire de Waka	Govt. Nurse	3	0	Yes	0	6	20	100	2	1	2007	-	Same	No	3	Diar	Mala.
Dispensaire de Bombo	Health Agent	2	2	Yes	0	11	35	150	2	3	4,000	9	Same	Govt.'82 PAM	7	Diar.	Mala.
*Dispensaire de Bele	Health Aide		2	No	0	5	19	200	1	2	500	4	Same	'81 -'82	2	Unk.	Unk.
Dispensaire de Cothiary	Govt. Nurse	3	1/12	Yes	0	6	25	150	1	5-7	2,000	10	?	?	1	Unk.	Unk.
SINE SALOUM																	
Dispensaire de Diarotha	Agent	2	1/3	No	0	6-8	27	175	2	2	16,000	7	--	No	20	Mens.	Mala.
Dispensaire de Touba Counta	Govt. Nurse	3	3	Yes	7	9	50	375	4	3	4,000	10	Less	Govt.'82 5 Kg.	20	Mala.	Mens.
*Dispensaire de Niar	Med. Tech.	2	6	No	1	9	30	200	1	4	800	5	Less	Govt.'82 10-15 Kg.	10	Mala.	Mala.
*Dispensaire de Caiby	Govt. Nurse	3	4	No	0	7	25	275	3	4	10,615	1	Same	Govt.'82 4 Kg.	7	Mala.	Unk.

* Growth Register used in Part III analysis

FIGURE .8 : CHARACTERISTICS OF 45 RANDOMLY SELECTED FEEDING CENTERS, concluded

Center	Center Directors				Center Characteristics						Pop. in Area	Max. Dist. (Kms.)	Income for Area	Other Foods Kg./ Child	Mortality of Children in Program		
	Basic Train.	Yrs. Ter.	Yrs. in Cty.	Nutr. Trn.	Sub-Ctrs.	No. of Grps.	No. in Group	No. in Prog.	No. of Aides	Days Open/ Week					Deaths/ Year	1st Cause	2nd Cause
*Dispensaire des Soeurs de Ronghoul	Amer. Nurse	8	5	Yes	3	28	25	480	2	5	5,000	80	Some	No	18	Male.	Diar.
Dispensaire de Wack N'Gouna	Govt. Nurse	3	2	Yes	4	18	35	280	2	4	7,000	-	Less	?	6	Male.	Diar.[1]
Dispensaire de Pass Koto	Govt. Nurse	3	3	Yes	-	9	25	200	3	4	500	6	Less	Govt. Dec. '80 5 Kg.	5	Male.	None.
THIES																	
Dispensaire de Ndiayene Sirakh	Govt. Nurse	3	4	Yes	0	8	30	235	2	4	5-600	3	Less	Govt.'81 5 Kg.	32	None.	--
*Dispensaire Social Bte de St. Louis	Social Ass't	3	4	Yes	0	9	40	400	5	2	800	5	Some	Govt.'80 5 Kg.	3	None.	Male.
CER de NGounelane	Health Agent	2	2	Yes	0	5	30	165	2	2	10,345	5	More	?	2	None.	Diar.
*Dispensaire de Pambal	Teach. French	3	1	Yes	2	9	40	378	2	1o		5-6	Some	Govt.'81 5 Kg.	9	Male.	None.
CER Thiadioye	Govt. Nurse	3	1	Yes	1	8	30	291	3	2	10-12000	2-4	?	Pan-Am 81 16 Kg.	3	Male.	None.
NDour	Social Aide	3	3	Yes	1	12	45	150	2	4	1500-200	15	More	No	4	Male.	Diar.

*Growth Register used for Part III analysis

D. Part IV (Field Work)

2. Evaluation of Fieldwork in 16 Centers (May 1983)

a. Methodology

This field work comprises a 16-center sub-sample of the 45 randomly selected centers to which a questionnaire had been previously applied in December 1982-February 1983 and from which registers had been requested. The purposes were to:

(1) Augment the statistical data contained in Parts I though 3 by delineating the program's overall strengths and weaknesses in regard to personnel capability, training, supervision, workload and available material resources including food and audio-visual material

(2) Interview mothers to determine the effectiveness of educational efforts and to learn how they view the program parts including food delivery.

(3) Identify issues and problems that appear to impede better program results.

Prior to arrival in Senegal, the U.S. evaluators selected 20 centers from the 45 in the original random selection. The centers were selected in the same geographical proportion and according to type and number of beneficiaries served. Although it was considered desirable to include at least half of the centers where register data had been analyzed, time constraints reduced the number which could be visited. Sixteen were finally selected according to representative criteria, but the selection process also responded to the special interests of the data analyses whenever that could be accommo- dated. In addition, the opportunity to observe weighings and educational sessions was a consideration in the final selection. In eight of the sixteen selected centers, the registers had been usable for the data analysis previously conducted in California.

The composition of the centers selected is compared below with that of the 45 randomly-selected centers:

Representation	Composition: 44 Centers	Composition: 20 Centers	Composition: 16 Centers	Register Analysis
Geographical				
Cap Vert	3	1	1	1
Casamance	8	4	4	4
Diourbel	3	1	1	0
Fleuve	10	5	3	1
Louga	2	1	1	0
Senegal Oriental	5	2	1	0
Sine Saloum	7	3	2	1
Thies	6	3	3	1
Center Type				
Dispensary	35	15	12	
Social Center	4	3	2	
MCH	2	1	1	
Other	3	1	1	
Beneficiary Size				
Over 300 children	13	7	5	
200-300	15	6	5	
Under 200	14	7	6	

This part of the field work was carried out by two teams. One concern was to have DANAS and CRS represented on both teams. Team 1 was to cover the regions of Sine Saloum, Senegal Oriental, Casamance, and part of Thies, while Team 2 was to cover the regions of the Fleuve, Louga, Diourbel and part of Thies. Both teams were scheduled to complete their respective field work in about 10 days, then return to Dakar to complete the synthesis as a group and continue the compilation and interpretation of other data.

Prior to site visits, the field team obtained some quantitative center data from CRS on: level of food delivery; current targeting of under three year olds and malnourished; and the number of deaths over a 12-month period as indicated on the old questionnaire. Based on these data the centers were rated on a scale of one to five. Other program components were assessed in the same manner with a subjective team consensus reached for level of performance for mother knowledge, motivation, initiative and center director capability.

Team 1's member from the United States led the group, providing direction in what was an experimental attempt to make on-site assessment of program strengths and weaknesses. This was in addition and complementary to the standardized questionnaire application and collection of other data and observations. The team held pre-visit analysis sessions based on data assembled in folders for each center. Subsequently, they followed up each center visit as early as was feasible with detailed discussions and note-taking observations and questionnaire answers. The intensive group process concluded with a group consensus or evaluation of mother and center director performance, noting supporting examples from the questionnaires and

observations that related to knowledge, motivation and initiative. This experimental method was intended to go beyond or enrich the other more concrete data gathered by questionnaire on director and mother capability pertaining to training, time in center, specific education subjects, etc.

Several information sources and instruments were used to compile and gather data obtained in Field Work II. They are listed below with the particular intent of each:

(1) Questionnaire and Notes from Previous Field Work. The questionnaires and notes provided a background of the center and its population setting. The questionnaire answers provided precise information on certain aspects of the workload.

(2) Data sheets on nutritional status deciles on each center, as normally compiled by CRS/Dakar and to which food distribution data was added.

(3) CRS Master Sheets on centers, from which age composition and nutritional status percentiles could be summarized for children enrolled on a specific date.

(4) Questionnaire for Mothers and Mother Committee Representatives to test knowledge about program objectives and commitment, grow. charts, health practices and treatment, value ascribed to the food received, motivation, and initiative.

(5) Questionnaire for Center Directors to determine center characteristics, Director's level of training and perceived needs, supervision frequency, understanding of program objectives and child health needs, attention to educational program, ability to teach mothers, appropriateness of attitude, motivation, and initiative.

(6) Observation sheet for evaluating the accuracy of weighing and recording; quality of education and counseling; noting the general condition of the center and food storage facility; supplies available including food stocks, teaching and demonstration materials, and forms.

(7) Resume or synthesis sheet for recording observations and impressions of the team.

Each of the two teams compiled answers to questionnaires that were administered to mothers and center personnel during separate field trips to different regions of Senegal. The findings were then discussed in a combined field trip. The oral presentation was made to the entire field team membership with the hope of obtaining other perceptions and interpretations of the observations and data.

This effort to bring the principal findings of the May field work into play during the consultants' stay in Senegal did not give all participating parties sufficient time to feel familiar and comfortable with the data and analysis. A first draft of this written report, which was much more detailed than the oral summary of highlights, was left in Senegal and studied following the consultants' departure.

Several months later, the Government of Senegal accepted the results and interpretations, making suggestions and modifications to be incorporated in the final version.

Principal sources for the findings in this section are:

(1) Questionnaire data collected and observations made in (May 1983) and synthesized at the end of the day;

(2) Interviews with regional coordinators and doctors;

(3) Information and data collected in Field Work in December 1982-February 1983 by the PPNS-USAID consultant team;

(4) Data analyzed from the CRS Master Charts for the 16 centers;

(5) Data compiled on Title II food distributed from CRS reports;

(6) Observations made by the design team in 17 centers in May 1982.

Problems Encountered

Problems in scheduling two large teams, with representatives of all involved agencies, were encountered. Members of both teams were called back to Dakar from the field in the middle of the field trip by their parent organization.

Time constraints are especially significant in carrying out field work to assess this type of program. The weighing/distribution sessions may be observed only on certain days of the week and at certain times. Schedules are not always available, up-to-date or accurate in the capital. Communications do not permit immediate confirmation of this information in many of the remote centers. Even with 100% available and accurate information, a schedule drawn up for a short period allocated for field visiting over a large geographic area inevitably falls victim to other unforeseen problems such as broken-down vehicles, absences of directors due to illness or other emergencies. Thus, while it was hoped during planning in Dakar that the two teams would be able to observe 10 weighing and distribution sessions during the 10-day field work, in fact, only six sessions were observed due to modified schedules, absent staff and other logistical problems.

Even without a scheduled program, however, it is possible to carry out field work and get a good feeling for how the center operates by observing the condition of it and the attitude and knowledge of the Director. Directors were asked, when there were no sessions to observe, how they explained the growth chart and how they would counsel mothers in a number of hypothetical situations. While observation is preferable, it is also tainted by the presence of the sponsoring agency and outside evaluators and just as likely to be an atypical portrayal of the director's normal operating procedure as his answers to the interviewer's questions about how he does it. In the absence of weighing, the questionnaire can be applied to the director more successfully without the distortions due to the press of activities and time.

It is extremely difficult, however, to be assured of a random selection of mothers without the scheduled weighing and distribution session. Finding

mothers to interview in those circumstances normally entails asking the Center director to identify participant mothers in the village. It appeared that most often the directors chose mothers who lived nearby. This might bias the sampling in that mothers living close to the center may be the more active and better program users than the others.

An additional problem resulting from the short time allotted to center visits is that the sample of mothers is small, three per cent in a total of 16 centers. The alternative was to ask fewer questions and to interview more mothers per center. From other experience (Evaluations in Cameroon, Haiti and The Gambia) the team leader decided that variation is not always that pronounced among mothers of a center and that the lengthier questionnaire with more compiled information should be applied to fewer mothers. Nevertheless, sample size of mothers is clearly a constraint in this evaluation.

b. Results

Distinct from the program components, which are assess in the next section, are indicators of effective program progress. These include: a) quality or success of mother education; b) targeting of the most vulnerable child population (by age and by nutritional status); and c) cumulative coverage of Senegal's mother population.

a. Quality or Success of Mother Education

i. Mother Knowledge.

The teams tested mother knowledge in an effort to determine: mothers' understanding of the individual growth chart and their general knowledge about prevention and treatment of infant/child health problems. Three mothers were interviewed in each center for a total of 44.

Twenty-nine (66%) of the mothers had a good understanding of the chart and whether their children were gaining, losing or maintaining weight according to age. See Table 1, page A-87.

Understanding was poor in two centers. In both instances, the staff employed two different growth charts in the mother groups so that any explanations were confusing with some mothers using the CRS chart and others in the same group using the Government of Senegal's Road-to-Health card.

Mothers' ability to understand the chart correlated positively with good present or previous director capability or, in two cases, with substitute capability which was provided either by a paid assistant or a mother helper.

A very short time in the program adversely affected results. Only two mothers has been in the programs three months or less and both were unable to explain the chart. However, lengthier time in program did not always correlate with greatest knowledge either of the growth chart or, as seen further on, of general health. The average length of time in program based on mothers' replies, was estimated to be six years. In that context the results are not as impressive. Mothers in the program for three years did just as well or better than mothers who were in for longer periods.

Forty-one percent, 18 out of 44 of the mothers, gave adequate answers to questions about aspects of general health.

Mothers were asked specifically what action they would take in case of child diarrhea with ability assessed on the basis of whether or not they could repeat center counsel given on malaria and measles as well as diarrhea. The answers are combined under general health knowledge. In only one center, with highly capable direction plus audio-visual health teaching materials, was performance of high quality on general health.

ii. Mother Motivation.

Motivation was tested to determine: commitment to attend weighings regularly; understanding with regard to program priority on child health and education rather than on the food given; and the attitude or action (hypothetically or

actually) taken by mothers in the absence of food distribution. See Table 2, page A-87.

Except for the two mothers in the program for less than three months, all understood the rules for regularity of attendance. All but six mothers from two centers stated that the program's priority emphasis was on health rather than food distribution.

In replying to the question of whether or not they would bring their children for weighing when food was not available for distribution, all except two (including a new mother) gave affirmative answers. However, when asked to explain why they would come, seven of the 42 gave "wrong" answers such as: so the center director can fill out his report; to pay the fee; to ensure getting food later on; and just in case food might come. ("Right" answers were: to weigh their child; to learn about the child's health, etc.)

Responses to a related motivational question, testing the mother's understanding about the use made of the fee collected each month were as follows:

(1) Twenty-seven of 52 responses (some mothers gave more than one response), or more than half, understood that the money collected was used for administering the program (mainly, paying for transport);

(2) 11 of 52 responses, or nearly one-fifth, were that the money was used to buy medicines and other supplies, mainly growth charts;

(3) Eight were don't know responses;

(4) Only 6 of the 52, or 11% of the responses suggested a commonly-heard theory that many program mothers see the Center food distribution as a marketplace where she puts up a fee in exchange for a good buy of Title II food.

iii. Mother Initiative.

Initiative was assessed on the basis of activities in support of, or beyond, the programs that were being considered, or already being carried out, in the community. The question was asked of either the mother committee president or chairman or other spokeswoman.

Table 3, page A-88 shows a disappointing level of activity in the 15 centers where a Committee representative was available for interview. Exceptions were two center groups of women who had made heroic efforts in support of the feeding program: pooling money to build a center with maternity in one case, and in another, providing the resources to build a new warehouse though no food had been delivered for many months.

Only three center groups of women had begun activities beyond the program. These were gardening and chicken-raising. Three more center groups had given thought to activities described as follows: gardening; collective farming; and cloth-dying (to earn revenue for buying medicine). In seven center groups, the mothers had given no thought to organizing other activities.

b. Targeting of the Most Vulnerable Child Population

i. Age at Entry.

The 16 center directors, asked to estimate the average age of infants/children at the time of enrollment in their center, responded as follows:

— At birth:	30%
— 1-3 months:	20%
— Under six months:	30%
— Under 1-2 years:	20%

Thus, the directors estimated that 50% were under three months of at entry, and that 80% of the newly enrolled children were under six months.

Both directors and the mothers who were active in the local committees were asked to indicate any differences perceived in:

(1) Children who enter early (defined as 10 months or under) and those who enter late (defined as between one and two years);

(2) Mothers, or families, who enroll their children early (under 10 months) and those who enroll their children late (one - two years).

The fact that so many of the children were enrolled early (80% of them) made this a hypothetical question in most cases. It was also a little too long and complex. Many mothers found it very difficult as did several directors.

With regard to differences perceived in younger versus older enrolled children:

(1) Most of the responding center directors said that young enrollees start out in better health and are more easily maintained in good health, while the older ones are already failing and are difficult to recuperate. Only one replied that the younger enrollees have more problems adapting to CSM with resulting diarrhea.

(2) The mothers' committee representatives who understood the question (10 of the 16) tended to view the difference in time of enrollment in the same way as the directors: when enrolled at a younger age, the children were in better health. Several mothers saw early enrollment as the means to lengthier eligibility for food rations. Two mothers noted that CSM gives younger children diarrhea while the older ones tolerate it better.

With regard to the question about differences that might be perceptible among women (or families) who enroll their children at a younger, rather than older age, the results were:

(1) Most of the center directors' answers were that mothers who enrolled children early were more motivated than the others, understood about child care needs and were more evolueés (sophisticated).

The second most frequent answer, consistent with other data on the lengthy time mothers remain in the program, was that the women who enroll

their children early are already in the program -- i.e., were eligible with a previous child.

Other directors' answers were: the early enrollees are those who hear about the program early; late mothers are usually transfers into the community; and late mothers are ones whose husbands are reluctant to pay the fee, especially in the absence of Title II food.

(2) Committee mothers' answers most often agreed with those of the directors: mothers who enroll early know more about child care and are motivated, while the late enrollees tend to be skeptical of the program and wait to see what others get out of it. Other mothers mentioned the advantages of enrolling children at the earliest time possible so as to receive food benefits longer.

The answers corroborate general knowledge and data analyses elsewhere with regard to good nutritional status in the very young and failure during the weaning period.

The questions asking about the relationship between health/nutritional status and age at entry turned out to be a useful means for determing director and mother leader knowledge of the aging factors in child growth and the extent to which they recognized weaning time stress in the "older" enrollees.

iv. Coverage of Program in Senegal: Cumulative Mother Reach.

Coverage of mothers or families over time is of course a key factor in determining program cost-effectiveness, especially if the education of mothers is a central project goal. In order to estimate the degree of cumulative mother or family coverage, the mothers in 16 centers were asked, how many of their children were enrolled at the present time and then how many had ever been enrolled. In seven centers mothers were also asked how many years they had been enrolled in the program.
Mothers were less certain of the accuracy of their response to the latter question. However the results obtained from the two questions are consistent and make sense in the context of center age as well.

Table 4, page A-89 shows the results. Just after gathering the field data, it was suspected that the first mothers, who were Committee presidents, treasurers or spokeswomen might be unrepresentative and may have been in the program disproportionately longer than other mothers. Committee mothers had fewer children than the others. Fourteen Committee members had an average of 3.2 children who had ever been enrolled in the program, while the other 29 mothers (No. 2 and No. 3 who were non-Committee members) had had 3.5 children enrolled.

A breakdown of mothers revealed:

(1) The mothers currently in the program had an average of 1.45 children; (Therefore, a family received an estimated 2.45 rations of food since the mother would receive one ration for herself in addition to the 1.45 rations for enrolled children).

(2) The average of children ever enrolled per mother was 3.5; and

(3) The average number of years mothers remained in the program was 6.3 years. (This is based on information obtained from the 3 mothers in only 7 centers.) This may be compared with the average age of centers visited (Table 5, page A-90) which is 6.9 years.

A large percentage of mothers in our sample had been in the program since its inception in the community. Since there are no criteria for mother graduation and evidence of low turnover rates, there is reason to suspect that increases in cumulative coverage of mothers each year are small and that these are occasioned by family transfer, ineligibility caused by irregular attendance and the end of child-bearing years.

The field data on mother years in program warrant confirmation by larger samples of randomly-selected mothers. However, other program characteristics and information suggest that the results of this small sampling may not be far off. The rates of turnover are relatively low— with 4.7% new entrants per month and 3% departures. The average number of mother-child rations programmed by Cathwel/Dakar based on previous experience in the Senegal program has been 2.2, compared with the 2.4 reported by the sampled mother.

2. Program Components

a. Center Setting

The data indicate that:

(1) Most of the centers operate out of dispensaries. Others are in social subcenters, and religious missions. One was a in health hut.

(2) The average length of time the centers have been operating is seven years, with center age ranging from two to 18 years.

b. Center Direction

i. Experience of Directors

Table 5, page A-90 also shows that most of the directors in the 16 centers had had three years of training and were qualified as government nurses or social assistants. Others were medical technicians, health agents and nurse's aides with two years of training. One community health worker had only five months of formal training. Half of the state nurses had training in nutrition and in all, six of the 16 Directors had received nutrition training.

The average length of time directors had served in the centers was just short of four years, ranging from a few months to 10 years. Nurses and medical technicians had served longest, averaging nearly five and a half years compared with an average of less than one and a half years for health workers and nurses' aides.

ii. Capability.

The team rated six center directors above average. The best performances was evidenced by directors with three years of training whether they were state nurses, missionary teachers or social assistants. A seventh center was rated above average due to the able assistance of mother helpers. Of the seven "best" centers four were Government dispensaries, one was a missionary dispensary, one a social sub-center, and one a health hut (case de sante). Length of service in the centers by the better directors ranged from two to six years with the average, being slightly over three years.

When performance was rated below average, the center directors' training was of shorter duration. This included two medical technicians with two years training, a first aid worker (aide-soignant) and a community health worker, each with five months of training. The type of centers served by these directors were the same as those in which the best performance was observed (government dispensaries, a social sub-center and a missionary MCH.) The directors' length of service at these centers varied widely, ranging from nine months to ten years, and averaged five years.

In conclusion, associations are evident between: longest duration of training and best performance; and longest time in center and poorest performance.

When compared with the ratings for mothers' performance, the best was observed where the highest quality direction (though not from the director) was provided, while the poorest was observed in conjunction with the least adequate direction. The correlation between best mother performance and best center direction was not, however, consistent in the rest of the centers although there was a trend toward it.

iii. Training.

Center personnel receive very limited on-the-job training. The training which is provided is sporadic, brief and focussed on how to use new forms for food reporting or to record child weight, absence, death, etc. There was no mention of on-the- job training aimed at instructing mothers.

Twelve of the 16 directors expressed the desire and need for further training. The areas most frequently mentioned by directors, in order of expressed interest is as follows:

- General, overall training.
- Education, pedagogy, nutrition and child care.
- Administration, including food distribution and planning.
- Specific administrative training on the Master chart.
- Group communication techniques.

In general, those directors with fewer years of formal training and who were rated lower in performance by the teams (nurse's aide, first aid worker, community health agent) felt that their greatest need was for overall

training. Those with more formal training and who were performing more adequately in the team's opinion, requested help with the mother education and motivation component of the program, in regard to both content and technique. Of the four directors who said they did not feel the need for further training, two were well qualified, while the other two were appraised by the team as among the weakest directors.

In conclusion, a majority of the center directors need, and feel the need for, administrative training. Only a few, however, recognized the need for technical training that would enable them to carry out more adequate mother counseling or provide a basic nutrition and health education program for mothers. These are areas for which they are not accountable.

iv. Motivation.

During Field Work I, many of the 45 center directors interviewed complained about the lack of incentive pay for the extra duties performed in the child-weighing mother groups and distribution points. Included in this 16-center study are five of the directors who had offered this criticism. Of these were government nurses, one a nurses' aide and one a mid-wife all of whom worked in dispensaries. The fifth complaint came from a social center. During Field Work II, the team rated three of the five who had complained about the lack of compensation, as well motivated in other respects. In fact, there was a more frequent correlation between directors who did not complain and those the team rated as less motivated.

In summary, overall motivation was not found to be lacking among those who complained about inadequate pay. Some regional directors told team members they thought the complaints were justified; one, in fact, noted that everyone else in the PFNS program hierarchy got some benefit from it except the center director who had to administer it.

c. Supervision

Table 6, page A-91 shows whether or not supervisory visits by officials at the different levels of government and CRS had been made to the centers during the preceding 12 months. The department coordinators had made the most frequent visits followed by the regional coordinators and Cathwell representatives (food checkers). In nine out of the 16 centers, coordinators appeared to share the responsibility (one or the other had visited over the past year.) The visits of by a regional and departmental doctors were rare. Cathwel visits were considered "regular" in 11 of the 16 centers. When asked about the Cathwel visits responses often included complaints about the inordinate concern with the financial and administrative aspects of the program. In fact, the protocol for center visiting is an administrative checklist. Most supervisory visits did not follow an annual schedule but were carried out on a response-to- problem basis. In two instances, directors received unusual support and technical training supervision from unexpected sources; a community health worker, her assistants and the mother groups were regularly encouraged by the regional doctor in one case while in another, a new community health agent was working closely with a nurse from a neighboring village. In the latter case, the nurse was teaching the agent content and techniques for mother counseling and the two had worked out a source notebook

on health problems and care. A a rule, however, technical supervision or education content and techniques for teaching mothers was not provided.

The extent of supervisory visits did, for the most part, correlate with better quality programs. In other centers, however, infrequent supervision did not have an adverse effect on good mother results or on excellent program management.

d. Workload

The center workload was assessed using two types of measurement. In one, the number of groups per center each month, or the number of partial days devoted to child-weighing, mother education and food distribution was ascertained. The other compared the number of children weighed to the help available during the program sessions.

Table 7, page A-92 shows that the number of group sessions per month varied from four to 13 with an average of eight groups meeting each month. The smallest number of children served by a center was 108 and the largest was 741. There was also wide variation in the number of children weighed in each session (ranging from 24 to 71, with an average of 39.) This was considerably higher than the desirable 30 (25 mothers) which had been envisaged in the program objectives. The ratio of children weighed to the help available ranged from 8:1 - 35:1. An average of 2.7 persons assisted in the weighing sessions, which was close to the three persons needed for a smooth scenario (one to read the scale and help the mother with the child, one to fill out the Master Chart and find the percentile, and a third to make the Register entry, mark the individual chart, and hopefully counsel the mother appropriately). In three centers, a single person attempts to do all of this, often paying attention only to the Master Chart and missing the opportunity for effective mother contact.

The average ratio of children to available help was 18:1, not excessive if well organized and the mothers assist. There were no plans to train or use mothers in the weighing operation, although mothers do participate in food division.

It can be speculated that the larger the group, the more diluted is the attention to mother counselling during the food distributions and educating sessions. This assumption was made in the ratings given in Table 7. It would also seem that the larger the numbers of children served in a center, the greater the paperwork burden would be both at the time of weighing and distribution and at the end of each month when reports are due.

e. Availability of Materials

Table 8, page A-93 summarizes the educational and food demonstration materials that were available in the 16 centers visited. Standard audio-visual aids have not yet been provided by the program management. Cathwel, Dakar had sponsored the design of audio-visuals for the centers but did not have the resources to have them printed. In four centers, the directors had obtained materials by chance or special initiative: one center had been given a set of flipcharts prepared by AID for Sine Saloum but had not yet been able to use

them; the Sisters in two religious centers had either developed or obtained audio-visuals; and one center had Belgian materials.

In nine of the centers, reference or source materials were available. These were usually Cathwel-provided booklets on specific health problems. Food demonstration materials were present in only seven of the 16 centers.

The range in resources available to the centers varied from well-stocked pharmacies, which provided of regular family health care, extra milk and tinned foods, to starkly minimal supplies and services in others.

f. Title II Food Availability

The overall percentage of food received (out of the 7.5 kilogram of Corn-Soya-Milk (CSM), sorghum and millet programmed per beneficiary per month) was 80% during the selected study period. There was wide variation in the percentage of foods delivered to the different centers, ranging from 52% to 111%. This is a variation of similar magnitude to that resulting from the several-month food interruption in early 1982 when the percentage of food received in selected centers of all regions (except Thies) dipped from 54% in January to 44% in February, from 23% in March, to 33% in April, and back up to 62% in May.

Table 9, page A-93 estimates the daily availability of Title II food to families and its nutritive value in calories and protein grams. It was noted above that 7.5 kilos of Corn-Soya-Milk, Soy-fortified Sorghum Grits and Soy-fortified cornmeal are programmed for each beneficiary per month. It was also calculated that, on the average, 80% of the food arrives at the distribution centers. The mothers interviewed had an average of 1.45 children each (Cathwel noted that they normally program for 1.2 children). The average monthly ration per mother, or family, may then be estimated as follows: 7.5 kilos x 80% x 2.45 rations, for a total of 14.7 kilos a month or 490 grams of Title II food daily. Assuming the 490 grams to be 50% CSM and the other 50% to be equal amounts of sorghum and cornmeal, the nutritive value is 1852 calories and 84 protein grams daily. A child between 13 and 36 months of age requires approximately 1360 calories and 37 protein grams daily. Thus the nutrients available could meet 68% of the calorie requirements of two such children, and 114% of the protein requirements. However, the Title II food for the most part is shared by other family members. Without prompting, interviewers were told by mothers that foods were used by the family.

Table 10, page A-94 demonstrates that only rarely were foods reserved for the children (the provisions lasted less than half of the month and in three instances, only four to seven days.) CSM lasted an average of 14.6 days, which was slightly longer than the cereals which averaged 12.7 days, according to mothers. Inasmuch as only two of the center directors said they were urging mothers to reserve all or part of the CSM for the young, the length of time the food lasts is surprisingly high; since the food provided could be used up in the family pot within a few days. The extent of this "targeting" to younger family members is unknown and when present, does not correlate with greater mother awareness and knowledge.

The economic value of the food delivered to a family was estimated based on two sources from different villages, one from the Center Director in Maka and the other from a woman working in the Mbar market. The first estimated the local market value of the 7.5 kilo ration to be worth 750 CFA; the second suggested the going rate was 120 CFA a kilo of cornmeal-like CSM or the sorghum and cornmeal, or approximately 900 CFA.

Using the average 850 CFA as a rough estimate, the monthly value to a family might be calculated as follows:

- Value of 7.5 kilograms: 850 CFA
- Value of 80% of 7.5 kilograms: 680 CFA
- Value of 2.45 rations, 80%: 1666 CFA

At a rate of 360 CFA = $1.00, the U.S. dollar value would be 4.62 monthly. The ration would represent approximately $55 annually, a significant contribution to rural income families in Senegal.

V. DISCUSSION OF RESULTS

A. Validity and Limitations of Data

The findings reported in this study are based to a large extent on the use of data which existed prior to the study. As the recording systems utilized are not kept specifically for investigations such as the one reported here, it is important to question the quality of data from these sources. Consequently, the authors were cautious in their review and selection of the data for the latter two parts of this study. All data were key entered and verified after having been deemed acceptable. Unusual results obtained during the data analysis of Part 2 were discussed with CRS to determine their plausibility, validity, and impact on general findings. Similarly, whenever possible, unusual findings for centers in Part 3 were explored during center visits by the evaluation team. In addition, continuous review of the data by all agencies was part of the analysis process. The findings of these follow-up activities have been considered in the interpretation of the results of this study.

There were a number of possible internal evaluations of the validity of the data used in this study. These internal tests were based on biological plausibility and program characteristics. It was anticipated that the data would yield findings consistent with those of previous nutritional studies in LDCs. For example, both seasonal and regional variation in the percentage of children less than 70 percent of reference were expected to be found in the analysis of the data from Parts 2 and 3 of this study. These data yielded seasonal and regional distributions of nutritional status which are consistent with those expected based on knowledge of the regional and seasonal differences in Senegal.

Secondly, there were certain expectations of findings in Part 3 results based on knowledge of general PFNS program guidelines. For example, children of both sexes were present in the program in equal proportions and with similar distributions of nutritional status. The vast majority of children entering the program entered prior to two years of age and the results indicate that more children are entering the program than leaving.

In summary, the authors did not identify any overall inconsistencies in the findings based on Parts 2 and 3 of this study. The authors conclude that there is no reason to believe that the data from various sources used in this study are neither valid nor unrepresentative.

These data have been used to examine the nature and patterns of malnutrition in Senegal. The results will provide guidance in determining the most promising design interventions. Also, these data provide a means of examining over-all program effectiveness in the following areas:

- Targeting on higher risk children - by a characterization of new program entrants;
- Consistency of attendance - by length of time in program and participation rates;

- Program administration - by characteristics of the food distribution patterns;
- Impact on nutritional and health status of the children-by education of the mothers.

B. Finding on the Epidemiology of Malnutrition in Senegal

In nutritional epidemiology, cross-sectional surveys of weight for age, although static, are employed with children to yield a dynamic description of their growth over time by examining the change of the distribution of weight/age in a population. The distributions of weight for age (or percents below some reference level) for children in LDCs typically shift according to age. These distributional differences reflect dynamic changes in rates of growth in different age groups. In most LDCs there are relatively low percentages of malnourished children, as categorized by weight for age relative to reference, among children less than six months of age. The percentage of malnourished children then climbs rapidly with age and reaches a maximum for children aged 12-18 months before beginning a gradual decline. This shift in the distribution of weight for age by age, therefore, provides a description of individual growth patterns and nutritional status among children in LDCs. The data from this study in Senegal are similar in this respect to findings in other LDCs.

The seasonal pattern of malnutrition in Senegal has been described in the results of Parts 2 and 3 of this study. The worst times (the times with the largest number of small children) occur in September and October, the end of the rainy season. This seasonal variation occurs in children under three years of age indicating that it is the health of these children which is most influenced by environmental factors. Consequently, they are the most vulnerable.

This general observation on seasonality and age is probably related, to some extent, to the finding in Part 1 that younger children were more likely to have had diarrhea. It also conforms to observations by some medicin-chefs that diarrhea epidemics follow the same seasonal patterns with the highest rates in September and October, the end of the rainy season. Other studies in the Gambia, etc., have documented the seasonal pattern of diarrhea incidence and mortality in young children. In our own study we have shown that most deaths occur between 12-36 months in children.

In addition to diarrhea and illness, there is also a food shortage at this time in October and September. It may be the youngest that get the least food at this time, and, due to the cultural factors, even less if they are ill or weaning.

Figure 2, page 6, provides a model of the biological, socio-economic and cultural factors which determine the nutritional status of young children. It must be emphasized that many factors affect nutritional status by influencing both food intake and absorption. This model also demonstrates where and how important program intervention strategies currently operate in Senegal. Food supplementation, surveillance of health and growth, education, and the treatment of important diseases like diarrhea can in

concert affect the nutritional status of young children. Other parts of the evaluation have examined each of these strategies separately.

C. Targeting/Participant Selection

Due to limited resources, programs such as this one in Senegal can never include all children. Consequently, such programs necessarily "target" populations which are identified as most vulnerable. Ideally, program participants should include all children who could benefit from the program and exclude children who could not benefit. Attempting to achieve an optimal balance through targeting is a difficult task. It is, however, essential to maximize program efficiency and effectiveness and to ensure that resources are parsimoniously allocated for maximum coverage of vulnerable beneficiaries. In Senegal, if funds and facilities were unlimited, the program could be increased and the targets widened because the program is full and there are families waiting to enter in most areas.

This study examines targeting by looking at current program participants and new entrants included in Parts 1 and 3. Characteristics of the regions from which samples were drawn and the participants' social milieu, age, socio-economic status, size and growth were assessed. This study has also yielded a description of geographic program targeting to villages based on examining the differences between 126 PPNS and non-PPNS villages.

1. Geographic Targeting

The results of Part 2 suggest that the percentage of malnourished children for Dakar and other urban centers was consistently lower and showed less seasonal variation than the non-urban centers. This result is not controlled for age and the authors caution that it is probably not justified to make policy decisions on the basis of this observation alone. However, it is unlikely that age differences account for the trends observed in these data.

The results strongly indicate that malnutrition is more prevalent in the rural areas compared to urban areas. Less than ten percent of the centers are located in urban areas and approximately two-thirds of the centers are situated in rural areas. Thus it appears that the program is geographically reasonably well-focused.

2. Villages Targeting

Results presented for Part 1 of this study suggest that PPNS villages (not including urban PPNS centers) are more developed than non-PPNS villages. These differences were noticed, for example, with regard to type of house, husband's occupation and education, mother's French school attendance and French reading ability, and in rates of DPT/polio, BCG and measles vaccination of youngest children. The differences, although significant and consistent, were not great. Similar differences were seen in the children's nutritional status and mortality rates.

This program depends heavily on the health delivery infrastructure of Senegal (approximately 85 percent of the centers are in dispensaries or maternities), and these results are therefore not unanticipated. In

conclusion, the bulk of this evidence indicates that centers are not situated in the less developed communities.

3. Socio-Economic Targeting

Small but consistent differences were observed between participants and non-participants in PPNS villages in the Sine-Saloum (Part I) study. These findings consistently indicate that PPNS program participants are on the average of lower socio-economic status than non-participants. There is a small group of mothers (8.6%) in PPNS villages who have never heard of the program. This group of non-participants is of consistently lower socio-economic level and the children had higher mortality rates than all others. Consequently, this group seems to consist of a characteristically different group of mothers in the PPNS villages who are not being reached by the program.

Family size and birth order are known to be important factors in the etiology of malnutrition. Mothers participating in the PPNS program were generally older and had more children than non-participant mothers. This is probably because the program is full and once in the program mothers tend to stay in and enroll their newest children.

4. Age and Nutritional Targeting

It was shown that the distribution of nutritional status of new program entrants by age resembles those of similar populations in other LDCs. All results indicate that nearly all new entrants during 1980-82 were under two years of age and slightly over one-half were under six months of age at the time of entry. It is important to continue to select young children in light of the observed malnutrition patterns of these young children. Under the age of three years, it is much too difficult to target children on the basis of size in communities where malnutrition is endemic. Essentially, the prevalence of small children with infectious disease and potential malnutrition is so high that targeting within this age group would probably be inefficient.

Children three to five years of age in LDCs generally have much lower mortality rates and exhibit more "normal" growth rates than younger children. However, it should be emphasized that many children of this age have just survived a difficult period and perhaps should not be excluded from continuing in the program solely because of a slight increase in their attained age. Children in this age range are still often small and of precarious health. There was an estimated 15.7 percent of the children in the program in this age range, i.e. 3-5 years, as of December, 1982.

Second, although some investigators think of these children as being "small but healthy" because of the "normal" growth rates, others insist that further investigation may reveal psychological, social, physical and other functional deficits.

D. Turnover/Attendance

The program policy of CRS is to exclude children from the program if they miss three consecutive months of attendance at the center. The purpose of

this policy is to require families to maintain a commitment to the program. Both the data which have been presented and the field observations support the presence of this commitment by the families. The disruption of food distribution did result in decreased attendance at centers, but attendance levels returned to normal immediately following the rupture period.

Longitudinal data were examined to estimate cumulative participation rates at various ages since program entry. It was concluded from these data that cumulative participation rates were near 90 percent for children through 30 months of age. Because of a potential selection bias, however, these rates are probably too high and actual participation rates are undoubtedly somewhat lower than this figure.

The monthly rates at which children entered and left the program during 1980-1982 were on the average about three percent. Although this figure does indicate the rate of flow of children into and out of the program on a monthly basis, it is difficult to determine the yearly rate.

To understand the rate of children leaving the program in more practical terms, consider a typical center of 250 children for any given month. During this month 7.5 children would be expected to leave the program. Based on the data of this study and the mortality rates for children under age five in Senegal, the 7.5 children would comprise 1.5-2 deaths, four graduates and one or two children leaving the program for unknown reasons.

E. Program Effects on Growth and Nutritional Status of Children

One of the important findings of this evaluation is that the length of time in the program is associated with a higher nutritional status for participating children. This finding is based on the results in Part 3 which include data yielding characteristic curves for children in the program over three different periods of time. In addition, these data yield results that show positive changes in nutritional status categories by length of time in the program similar to those seen in other studies.

However, it should be cautioned that these results may be partially explained by other factors, including the following:

- Higher mortality among small children which results in artificially high nutritional status for the surviving group.
- Selection bias in that the mothers who participate earlier and more frequently may also have healthier children irrespective of the program because of their generally high motivation levels.
- Length of time in the program is necessarily confounded with the increasing age of children in a cohort. It is known that children over 1½-2 years of age in the general population will show a general increase in nutritional status even in the absence of a feeding program.

This study has provided a unique opportunity to examine data which might clearly demonstrate program impact on nutritional status in spite of these competing explanations. This opportunity has been afforded by two

unexpected events: the disruption of food distribution in 1982 in Senegal, and the CDC survey of mothers and their young children in Sine-Saloum. The evaluation team stresses that failure to demonstrate impact clearly using data related to the rupture in food distribution could be attributable to numerous factors including:

- Weight for age is not affected by ruptures of such short duration. Data for indicators such as activity level and psychological functioning, which may be more sensitive to decreased food availability, were not available for analysis.

- Food distribution disruption may not affect food intake in children in the program.

- Short term compensation or coping by obtaining food from other sources, which may have occurred in mothers with children enrolled in centers experiencing a rupture, could obscure any anticipated short term effects.

- In the analyses, each center was categorized each month as either distributing food or not. However, some centers distributed partial rations. The analysis may have failed to detect a more subtle relationship between nutritional status and partial distribution.

- The short term effects may have been observable only in a small number of more vulnerable children.

To complete this evaluation of program impact on nutritional status in children, the data from Part 3 were analyzed implementing an analytic approach which evolved through discussions with AID/Dakar, CRS and DANAS in Senegal. This approach consisted of comparing distributions of nutritional status for children in the program with the general population data available from Part 1 while controlling for age. No significant differences were found. However, this analysis did not control for other confounding factors which affect nutritional status nor did it include time in program for the participants.

The results of multiple regression analyses indicated that program participation rates and time in program were significantly related to growth during two age intervals. These variables were not found to be strongly related to growth, but these results do contribute significant evidence of nutritional impact.

F. Diarrhea, Nutritional Status and Mortality

Diarrhea was mentioned by the Medicin-chefs as being one of the most common causes of death for the children attending the centers. There were no differences in diarrhea incidence between participant and non-participant children and a virtual complete lack of knowledge among the mothers of both groups regarding its appropriate treatment. These finding must be considered extremely important for improving program impact because of the influence of this very common disease on both the nutritional status and mortality of these children.

Overall, approximately 40 percent of the children had diarrhea within two weeks prior to their mothers being interviewed during the survey. The results of Part 1 of this study provide conclusive evidence that this disease is related to age, sex and nutritional status. The age range most affected is the same as that where growth in these children declines, 6-24 months, and males had consistently higher incidence rates than females over all age groups. The authors (as have investigators at CDC*) have concluded from analyses of these data that prevalence of diarrhea is also associated with lower nutritional status -- regardless of the choice of anthropometric measure for its definition.

The results of this study do not provide evidence that the percentages of malnourished children among participant and non-participant children in PPNS Villages are different. However, there is evidence of a trend that mortality in the vulnerable age groups is higher among nonparticipant children, and the failure to find differences in nutritional levels of these two groups must be evaluated and interpreted in consideration of this finding.

C. Other Program Effects

1. Use of Primary Health Care

The results of this study clearly demonstrate that food distribution encourages center attendance and the use of available primary health care. Participant mothers in Sine-Saloum were more likely to return to the center than non-participant mothers for prenatal visits and their children were more often vaccinated against measles.

2. Mother's Knowledge of Health Care

The results of the Sine-Saloum survey suggest an impact of the educational component of the program. The data reveal that pain de Singe, one of the treatments for diarrhea that is currently being taught by the program, is used slightly but not significantly more frequently by participant than by non-participant mothers. Participant mothers also demonstrated trends towards higher rates of malaria prophylaxis and treatment than non-participant mothers.

3. Incidence of Disease in Children

The children of mothers participating in the program were more frequently vaccinated for measles and treated prophylactically for malaria than were the children of non-participant mothers. It can be expected, therefore, that the children of participant mothers benefit from lower mortality rates and higher nutritional status than they would otherwise have experienced.

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*personal communication

H. Program Administration

This study has afforded the evaluation team the opportunity to make some comments relating to program administration. These observations are:

- PFNS centers are geographically well distributed based on the the distribution of malnutrition in Senegal.
- During the period of food distribution disruption, CRS attempted to distribute food stocks uniformly so that all regions of the county received comparable amounts of food. The results of Part 2 of this study demonstrate that CRS was quite successful in this endeavor.
- The supply of food to the centers appears to be irregular.
- CRS's estimates of population coverage in the Sine Saloum region were found to be accurate.

VI. SUMMARY OF PROGRAM EFFECTIVENESS

The following criteria of program effectiveness were chosen to judge the overall impact of the program and to integrate the results of the data collected and the field work. The evaluations indicate that the program is effective and has enormous potential for impact on the nutritional status of the children of Senegal.

- Integration of Nutrition and Health

  An attempt is made via the education program to integrate health and nutrition. In philosophy and practice, however, the two are perceived as separate and unrelated entities.

- Change in Nutritional Status

  An association was observed between length of time in program and higher nutritional status of children. There was also an association observed between length of time in program and growth rates for certain vulnerable age periods. These findings were comparable to the results of other evaluations in this respect. Because of methodological constraints and potential confounding effects of self selection, however, it is not possible to attribute this association solely to the program.

- Change in Health Status

  We believe that the participants in the program should have an improved health status because of observed trends toward increased vaccination rates, increased practice of preventive malaria measures and increased utilization of health services. And, in fact, mortality rates in the most vulnerable age groups were consistently lower for program participants than non-participants.

- Targeting and Coverage

  The program's targeting of the youngest age groups for new entrants is very good. The coverage of the program is estimated to be 10.3 percent of all children under 5 years of age in Senegal. Coverage could be increased though the development and implementation of rules governing program participation. For example, targeting could be refocused to under 3 year olds or household duration of participation could be limited so that other families with young children might have the opportunity to participate.

  Among those families with equal access and who know about the program, the lower socio-economic groups participate most. The approximately 10% of the population who do not know about the program are in a lower socio-economic group. At this point there are only slight attempts being made to target the most needy communities and no attempt is being made to limit the duration of a family's access to the program. The program is currently full and many children are waiting to enter.

- Turnover/Consistency of Attendance

  Consistency of attendance is very high because of strict attendance requirements for continuing participation and the amount of monthly movement in and out of the program is low. The former assessment is based on the evaluation team's review of center registers and on the participation rates.

- Education of the Mothers about Those Factors Which Influence Nutritional Status

  There is an effort to educate the mothers but the program is deficient in focus, materials and personnel training.

- Training of Personnel

  While programs are usually administered by trained nurses, the basic training and continuing education are inadequate to meet the needs of the program.

  In addition, there is no instruction provided in how to train or supervise personnel in the field.

- Supervision, Coordination and Motivation

  The supervision of the program is oriented too much toward administrative matters and there is no technical supervision of the weighing and mother education sessions.

  The lines of authority, responsibility and supervision of the program are not clear. In addition, there is a severe motivational problem because many of the personnel view the program as an unreimbursed and separate duty.

- Workload

  In certain areas of the program, personnel are overworked so that their effectiveness is impaired. This is often a problem of lack of organizational framework.

- Food Delivery

  Although the delivery of food to the centers appears irregular, the field investigation indicates that a large percentage of the food is actually delivered to the mothers on a timely basis despite severe logistical constraints. The ration per family is 2,000 calories per day.

- Cooperation Between Agencies

  This conjoint evaluation benefitted from the active participation of all agencies and is a good indication of existing cooperation. Everyone recognizes that it is a critical element in the future success of the program.

- Community Involvement

  The program has begun to stimulate some community activities through the active mother committees in some centers.

- Use of Surveillance Techniques to Monitor and Manage

  Growth surveillance data are used to follow center trends but are not as yet used in national programs of nutritional surveillance.

- Institution Building

  The program has great potential for stimulating the capabilities of nutritional institutions located in Dakar (such as ITA, ORANA, DANAS) in many areas such as surveillance, and the development of indigenous weaning foods.

- Other Criteria

  Economic impact and the manner in which the program deals with the use of indigenous foods to avoid external dependency are also important criteria by which to judge program effectiveness. Assessing these criteria was beyond the scope of this evaluation.

VII. RECOMMENDATIONS AND FOLLOW-UP ACTIVITIES

The evaluation team has determined five major areas which should be changed to increase the impact of the program. To accomplish this, the team has recommended that Phase III of this study will consist of a workshop to be held in Dakar after the distribution of this working document.

The goal of the workshop is to develop a specific action plan based on the evaluation results toward promoting change in those areas listed below which the evaluation team has deemed necessary to increase the impact of the program. This action plan will be developed conjointly between AID, CRS and DANAS and should reflect the findings and results of this working document. The action plan, based on the following recommendations, must be designed with the active participation of those agencies responsible for carrying out recommended changes if it is to succeed.

A. Education of Mothers

Design a plan for developing and implementing an education program for mothers that would emphasize the major child care practices for the nutritional status of their children. This program should intergrate the communication of both health practices such as oral rehydration for diarrheal disease and nutritional practices such as the appropriate use of weaning foods.

B. Training

Design a plan to implement a formal training and continuing education program for directors and/or their assistants working for the program in the field. This program should focus on the technical aspects of the program as well as communication techniques for educating mothers.

C. Supervision and Coordination

Design a plan that clarifies the lines of authority and coordination among persons working in the program.

D. Targeting and Coverage

Examine the possibility of implementing better community targeting and explore other ways to increase the impact of the program by increasing coverage to more of the vulnerable children and families in Senegal. For example, targeting could be refocused to only under three year olds or the duration of each family's participation could be limited.

E. Surveillance

Design a plan for the cooperative use of the monthly nutritional status data available from the centers.

VIII. APPENDICES

A. Tables and Figures

Part 1

Part 2

Part 3

Part 4

B. Description of CRS Program

C. Anthropometric Definitions of Malnutrition

D. Other Field Work

Tabulation Results of Questionnaires from 45 Center Chiefs and Regional Coordinators

PART I — TABLE 1

FREQUENCY AND PERCENTAGE OF MOTHERS BY PARTICIPATION STATUS AND PRESENCE OF A PPNS CENTER IN THE VILLAGE

	PPNS Villages		Non-PPNS Villages		Total	
	Freq.	%	Freq.	%	Freq.	%
Participants	181	59.5	165	12.1	346	20.8
Non-participants	97	31.9	779	57.4	876	52.8
No knowledge	26	8.6	414	30.5	440	32.4
Total	304	100.0	1358	100.0	1662	100.0

PART I — TABLE 2

FREQUENCY AND PERCENTAGE OF REASONS FOR CHILDREN IN PPNS VILLAGES NOT BEING ENROLLED IN THE PROGRAM BY ELIGIBILITY OF CHILD

Eligibility/Reason	Frequency	Percent*	Total Percent
Eligible Children			
Center too far away	4	6.5	4.1
Don't need it	13	21.0	13.4
Too expensive	2	3.2	2.1
Husband refused	2	3.2	2.1
No time	5	8.1	5.1
Negligent or lazy	3	4.8	3.1
Lack of information of how to enroll child	7	9.7	6.2
Center enrollment closed due to maximum participation	18	29.0	18.6
Other (don't know; no answer)	9	14.5	9.3
Total Eligible	62	100.0	63.9
Ineligible Children			
Child died too soon	7	20.0	7.2
Child too old	16	45.7	16.5
Child too young	3	8.6	3.1
Child traveling and not in village	8	22.9	8.2
Requested but not yet enrolled	1	2.8	1.0
Total Ineligible	35	100.0	36.1
TOTAL	97	-	100.0

*within eligibility category

PART I — TABLE 3

FREQUENCY AND PERCENTAGE OF RECEIPT OF OTHER FREE FOOD DURING PAST TWO YEARS AMONG NON-PARTICIPANTS

Receipt of Food	FFNS in Village		No FFNS in Village		Total
	Family does not participate	No knowledge of program	Family does not participate	No knowledge of program	
Yes	9 9.4	4 15.0	42 5.4	21 5.4	76 5.9
No	88 90.6	22 85.1	737 94.6	392 94.6	1239 94.1
Total	97	26	779	413	1315 100.0

PART I — TABLE 4

FREQUENCY, WEIGHTED COLUMN PERCENTAGE AND ROW PERCENTAGE* OF ETHNIC GROUP BY RESIDENCE AND PARTICIPATION STATUS

	PPNS in Village			No PPNS in Village			
Ethnic Group	Family participates	Family does not participate	No knowledge of program	Family participates	Family does not participate	No knowledge of program	Total
Wolof	64 29.0 54.2	39 36.7 33.1	15 36.5 12.7	81 47.8 10.8	443 55.9 59.1	225 53.5 30.1	867 49.7
Serer	94 60.2 60.3	51 56.6 32.7	11 43.5 7.0	47 30.2 14.1	172 23.7 51.7	114 28.0 34.2	489 32.3
Fal/Pular	14 6.6 73.7	5 5.0 26.3	0 0.0 0.0	27 1.4 12.3	120 14.5 55.6	69 17.4 31.9	235 13.9
Mandigue	5 2.6 83.8	1 0.7 16.7	0 0.0 0.0	4 2.3 26.6	10 1.5 66.7	1 0.2 6.7	21 1.2
Diola	0 0.0 0.0	0 0.0 0.0	0 0.0 0.0	1 0.5 50.0	1 0.1 50.0	0 0.0 0.0	2 0.1
Autre Senegalaise	1 0.4 50.0	1 1.0 50.0	0 0.0 0.0	3 1.7 8.8	26 3.6 24.5	5 1.0 14.7	36 2.1
Autre Nationalite	3 1.3 100.0	0 0.0 0.0	0 0.0 0.0	2 1.1 22.2	7 0.8 77.8	0 0.0 0.0	12 0.6
Total	181 39.5	97 31.9	26 8.6	165 12.1	779 54.7	414 30.5	1662 100.0

*presented within PPNS and non-PPNS villages separately.

PART I — TABLE 5

FREQUENCY, WEIGHTED COLUMN PERCENTAGE AND ROW PERCENTAGE* OF RELIGION BY RESIDENCE AND PARTICIPATION STATUS

	PPNS in Village			No PPNS in Village			
Religion	Family participates	Family does not participate	No knowledge of program	Family participates	Family does not participate	No knowledge of program	Total
Muslim	146 78.0 56.4	89 89.9 34.4	24 91.3 9.2	162 97.7 12.1	772 99.0 57.4	410 98.9 30.5	1603 95.6
Christian	35 22.0 77.8	8 10.2 17.8	2 8.7 4.4	3 2.3 21.4	7 1.0 50.0	4 1.1 28.6	59 4.4
Total	181 59.5	97 31.9	26 8.6	165 12.1	779 57.4	414 30.5	1662 100.0

*presented within PPNS and non-PPNS villages separately.

PART I — TABLE 6

FREQUENCY, WEIGHTED COLUMN PERCENTAGE AND ROW PERCENTAGE* OF TYPE OF HOUSE BY RESIDENCE AND PARTICIPATION STATUS

	PPNS in Village			No PPNS in Village			
Type of House	Family participates	Family does not participate	No knowledge of program	Family participates	Family does not participate	No knowledge of program	Total
Modern	35 19.3 55.6	26 25.6 41.3	2 7.6 3.1	17 10.7 14.7	69 9.3 59.5	30 7.6 25.8	179 11.2
Semi-Modern	49 25.7 57.0	33 35.0 38.4	4 17.5 4.6	33 20.6 14.9	128 16.5 57.7	61 14.5 22.4	308 18.6
Semi-Traditional	87 49.2 68.0	32 34.1 25.0	9 35.4 7.0	99 59.2 12.4	481 60.8 60.1	220 52.2 27.5	928 54.7
Traditional	10 5.8 37.0	6 5.3 22.2	11 39.5 40.7	16 9.4 7.3	101 13.5 45.9	103 25.7 46.8	247 15.5
Total	181 59.5	97 31.9	26 8.6	165 12.1	779 57.4	414 30.5	1662 100.0

*presented within PPNS and non-PPNS villages separately.

PART I — TABLE 7

FREQUENCY, WEIGHTED COLUMN PERCENTAGE AND ROW PERCENTAGE* OF CURRENT MARITAL STATUS BY RESIDENCE AND PARTICIPATION STATUS

	PPNS in Village			No PPNS in Village			
Current Marital Status	Family participates	Family does not participate	No knowledge of program	Family participates	Family does not participate	No knowledge of program	Total
Mariee	172 94.6 60.8	88 88.0 31.1	23 84.9 8.1	162 98.3 12.2	761 97.7 57.5	402 97.0 30.3	1608 96.3
Separee ou divorcee	3 1.3 42.9	4 6.6 57.1	0 0.0 0.0	2 1.3 12.5	10 1.3 63.5	4 1.1 25.0	23 1.6
Veuve	1 0.8 25.0	2 2.3 50.4	1 2.8 25.0	1 0.5 10.0	4 0.4 40.0	5 1.2 50.0	14 0.8
Celibetaire	5 3.4 50.0	3 3.2 30.0	2 12.3 20.0	0 0.0 0.0	4 0.5 57.1	3 0.8 42.9	17 1.3
Total	181 59.5	97 31.9	26 8.6	165 12.1	779 54.4	414 30.5	1662 100.0

*presented within PPNS and non-PPNS villages separately.

PART I — TABLE 8

FREQUENCY, WEIGHTED COLUMN PERCENTAGE AND ROW PERCENTAGE* OF MOTHER'S FRENCH SCHOOL ATTENDANCE BY RESIDENCE AND PARTICIPATION STATUS

	PPNS in Village			No PPNS in Village			
French School Attendance	Family participates	Family does not participate	No knowledge of program	Family participates	Family does not participate	No knowledge of program	Total
Yes	22 13.6 50.0	17 20.6 38.6	5 23.5 11.4	4 2.4 10.5	29 4.4 76.3	5 1.2 13.2	82 5.9
No	159 86.4 61.7	80 79.4 30.8	21 76.5 8.1	161 97.6 12.2	750 95.7 56.8	409 98.8 31.0	1580 94.2
Total	181 59.5	97 31.9	26 8.6	165 12.1	779 57.4	414 30.5	1662 100.0

*presented within PPNS and non-PPNS villages separately.

PART I — TABLE 9

FREQUENCY, WEIGHTED COLUMN PERCENTAGE AND ROW PERCENTAGE* OF MOTHER'S ABILITY TO READ FRENCH BY RESIDENCE AND PARTICIPATION STATUS

	PFNS in Village			No PFNS in Village			
Ability to Read French	Family participates	Family does not participate	No knowledge of program	Family participates	Family does not participate	No knowledge of program	Total
Yes	14 8.6 56.0	9 13.0 36.0	2 5.6 8.0	1 0.6 4.8	18 2.7 85.7	2 0.5 9.5	46 3.4
No	167 91.4 59.9	88 97.0 31.5	24 94.4 8.6	164 99.4 12.3	761 97.3 56.9	412 99.5 30.8	1616 96.6
Total	181 59.5	97 31.9	26 8.6	165 12.1	779 57.4	414 30.5	1662 100.0

*presented within PFNS and non-PFNS villages separately.

PART I — TABLE 10

FREQUENCY, WEIGHTED COLUMN PERCENTAGE AND ROW PERCENTAGE* OF HUSBAND'S EDUCATION BY RESIDENCE AND PARTICIPATION STATUS

	PPNS in Village			No PPNS in Village			
Husband's Education	Family participates	Family does not participate	No knowledge of program	Family participates	Family does not participate	No knowledge of program	Total
No schooling	134 74.5 59.6	70 72.6 31.1	21 90.4 9.3	149 89.1 12.0	712 91.7 57.6	376 91.8 30.4	1462 88.2
Some primary	9 5.7 69.2	4 5.1 30.8	0 0.0 0.0	9 6.1 25.0	18 2.3 50.0	9 2.1 25.0	49 3.2
Complete primary	17 10.1 68.0	8 8.1 32.0	0 0.0 0.0	1 0.8 4.8	13 1.9 61.9	7 1.7 33.3	46 3.1
Some secondary	5 3.0 38.5	7 9.3 53.8	1 3.2 7.7	1 1.0 20.0	2 0.3 40.0	2 0.6 40.0	18 1.4
Complete secondary	1 0.8 33.3	1 0.8 33.3	1 3.2 33.3	0 0.0 0.0	4 0.6 100.0	0 0.0 0.0	7 0.4
Some college	0 0.0 0.0	1 0.7 100.0	0 0.0 0.0	0 0.0 0.0	3 0.4 100.0	0 0.0 0.0	4 0.2
Not named	10 5.9 71.4	3 3.5 21.4	1 3.2 7.2	5 3.0 11.1	23 2.9 51.1	17 3.9 37.8	59 3.6
Total	176 59.9	94 32.0	24 8.1	165 12.2	775 57.4	411 30.4	1645 100.0

*presented within PPNS and non-PPNS villages separately.

PART I — TABLE 11

FREQUENCY, WEIGHTED COLUMN PERCENTAGE AND ROW PERCENTAGE* OF HUSBAND'S PRINCIPAL OCCUPATION BY RESIDENCE AND PARTICIPATION STATUS

	PPNS in Village			No PPNS in Village			
Husband's Principal Occupation	Family participates	Family does not participate	No knowledge of program	Family participates	Family does not participate	No knowledge of program	Total
Cultivateur	119 68.6 62.0	55 56.1 28.6	18 79.6 9.4	138 84.0 12.2	639 81.3 56.7	350 85.2 31.1	1319 79.4
Autre activitie primaire (pecheur, eleveur, mineur, etc)	6 3.4 75.0	2 1.7 25.0	0 0.0 0.0	4 3.0 12.9	18 3.0 58.1	9 2.6 29.0	39 2.9
Commercant	10 5.0 66.7	3 3.5 20.0	2 7.6 13.3	1 0.5 2.4	31 4.3 73.8	10 2.4 23.3	57 3.5
Artisan, ouvrier industriel	10 6.3 52.6	8 8.5 42.1	1 3.2 5.3	6 3.6 10.7	35 4.8 62.5	15 3.7 26.2	75 4.8
Fonctionnaire	7 4.1 50.0	6 9.6 42.9	1 3.2 7.1	1 1.0 8.3	10 1.4 83.4	1 0.3 8.3	26 1.9
Profession liberale, cadre, enseignant	2 1.2 40.0	3 2.4 60.0	0 0.0 0.0	2 1.1 15.4	9 1.3 69.2	2 0.5 15.4	18 1.1
Autre (activite economique)	18 9.6 58.1	12 15.9 38.7	1 3.2 3.2	10 5.7 23.8	19 2.5 45.3	18 4.6 42.9	78 5.0
Pas d'activite econimique	1 0.4 33.3	1 0.8 33.3	1 3.2 33.3	1 0.5 25.0	2 0.3 50.4	1 0.3 25.0	7 0.4
Ne sait pas	2 1.4 80.0	2 1.5 50.0	0 0.0 0.0	1 0.6 7.7	10 1.3 76.9	2 0.5 15.4	17 1.0
Total	175 60.1	92 31.6	24 8.3	164 12.2	773 57.5	408 30.3	1636 100.0

*presented within PPNS and non-PPNS villages separately.

PART I — TABLE 12

FREQUENCY, WEIGHTED COLUMN PERCENTAGE AND ROW PERCENTAGE* OF MATERNAL AGE IN YEARS BY RESIDENCE AND PARTICIPATION STATUS

	PFNS in Village			No PFNS in Village			
Maternal Age	Family participates	Family does not participate	No knowledge of program	Family participates	Family does not participate	No knowledge of program	Total
15-19	14 6.7 46.7	11 10.0 36.7	5 22.7 16.6	12 7.3 8.7	78 9.5 56.5	48 11.7 34.8	168 9.7
20-24	44 23.1 58.7	27 30.4 36.0	4 14.1 5.3	38 22.3 11.7	195 25.4 60.2	91 22.1 28.1	399 24.1
25-29	35 19.6 55.6	20 21.4 31.7	8 32.1 12.7	45 28.4 13.4	193 24.8 57.4	98 24.1 29.2	399 24.1
30-34	37 20.7 71.1	13 10.7 25.0	2 7.6 3.9	33 20.2 14.2	121 19.3 51.9	79 18.9 33.9	285 17.0
35-39	32 18.1 60.4	18 19.3 34.0	3 11.3 5.6	27 15.9 13.3	120 15.5 59.1	56 13.2 27.6	256 15.5
40+	19 11.9 61.3	8 8.2 25.8	4 12.3 12.9	10 0.0 8.1	72 9.7 58.1	42 10.0 33.8	155 9.6
Total	181 59.5	97 31.9	26 8.6	165 12.1	779 57.4	414 30.5	1662 100.0

*presented within PFNS and non-PFNS villages separately.

PART I — TABLE 13

FREQUENCY AND PERCENTAGE OF NUMBER OF LIVE BIRTHS BY RESIDENCE AND PARTICIPATION STATUS

	PPNS in Village			No PPNS in Village			
Number of Live Births	Family participates	Family does not participate	No knowledge of program	Family participates	Family does not participate	No knowledge of program	Total
1	19 10.4	21 20.3	3 15.1	8 5.2	137 16.9	71 17.0	259 15.3
2	16 8.9	19 20.3	5 18.2	29 17.6	109 14.2	61 15.3	239 14.7
3	30 15.3	17 20.8	2 6.7	26 15.4	116 15.6	67 15.9	258 15.9
4	22 11.8	12 11.9	5 18.7	23 13.2	109 13.4	54 13.1	225 13.1
5	25 12.9	7 6.6	3 13.1	23 14.6	73 9.3	48 11.6	179 10.6
6	12 7.0	8 6.9	1 3.8	20 11.7	68 8.6	37 9.3	146 8.6
7	22 12.7	4 4.1	2 7.5	10 6.6	41 5.4	24 5.6	103 6.5
8	13 7.7	4 4.4	1 3.8	7 4.0	48 6.3	18 4.0	91 5.5
9	10 5.7	3 2.4	2 7.6	8 5.0	34 4.5	22 5.4	79 4.8
10	7 4.3	0 0.0	1 2.8	8 4.7	29 3.9	7 1.7	52 3.2
11	5 3.3	0 0.0	0 0.0	2 1.4	10 1.4	1 0.3	18 1.2
12	0 0.0	2 0.0	1 2.8	0 0.0	3 0.3	2 0.5	8 0.5
13	0 0.0	0 2.3	0 0.0	0 0.0	1 0.1	1 0.2	2 0.1
14	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	1 0.2	1 0.1
15	0 0.0	0 0.0	0 0.0	1 0.5	1 0.1	0 0.0	2 0.1
Total	181	97	26	165	779	414	1662 100.0

PART I — TABLE 14

FREQUENCY AND PERCENTAGE OF NUMBER OF CHILDREN WHO DIED
BY RESIDENCE AND PARTICIPATION STATUS

	PPNS in Village			No PPNS in Village			
Number of Children Who Died	Family participates	Family does not participate	No knowledge of program	Family participates	Family does not participate	No knowledge of program	Total
0	78 42.1	45 46.5	7 27.7	68 40.8	331 42.2	168 41.2	697 41.8
1	47 25.8	31 32.9	7 28.1	39 24.1	184 23.8	109 26.5	417 25.5
2	27 15.3	8 7.6	4 15.1	35 21.2	119 15.4	60 14.5	253 15.1
3	16 9.3	8 8.1	7 22.6	13 8.2	68 8.6	27 6.4	138 8.3
4	5 3.4	2 1.9	1 3.7	4 2.2	41 5.4	26 6.1	79 4.7
5	7 3.8	3 3.1	0 0.0	3 1.8	20 2.4	16 3.7	49 2.9
6	1 0.4	0 0.0	0 0.0	2 1.2	11 1.4	4 0.9	18 1.0
7	0 0.0	0 0.0	1 2.8	0 0.0	4 0.6	4 0.9	9 0.5
8+	0 0.0	0 0.0	0 0.0	1 0.6	1 0.1	0 0.0	2 0.1
Total	181	97	26	165	779	414	1662 100.0

PART I — TABLE 15

FREQUENCY AND PERCENTAGE OF AGE OF YOUNGEST CHILD
BY RESIDENCE AND PARTICIPATION STATUS

	PPNS in Village			No PPNS in Village			
Age Youngest Child	Family participates	Family does not participate	No knowledge of program	Family participates	Family does not participate	No knowledge of program	Total
0-1 yrs.	61 35.7	30 42.2	12 40.9	46 32.1	216 33.5	115 37.1	480 35.5
1-2 yrs.	58 36.6	13 18.9	9 34.3	42 28.6	188 29.9	87 27.6	397 29.3
2-3 yrs.	29 18.1	12 17.7	2 5.9	35 23.4	120 19.2	66 20.8	264 19.5
3-4 yrs.	13 7.3	8 12.7	4 12.4	9 6.6	68 10.7	32 10.3	134 9.9
4-5 yrs.	3 1.5	3 4.3	2 6.6	10 7.2	31 5.3	7 2.6	56 4.1
5+ yrs.	1 0.8	3 4.3	0 0.0	3 2.1	10 1.5	5 1.6	22 1.6
Total	165	69	29	145	633	312	1353 100.0

PART I — TABLE 16

FREQUENCY AND PERCENTAGE OF PRENATAL VISITS FOR LAST PREGNANCY BY RESIDENCE AND PARTICIPATION STATUS

	FPNS in Village			No FPNS in Village			
Prenatal Visits	Family participates	Family does not participate	No knowledge of program	Family participates	Family does not participate	No knowledge of program	Total
Yes	99 51.9	52 54.1	8 31.7	73 44.6	298 37.9	108 26.2	638 38.2
No	82 48.1	45 45.9	18 68.3	92 55.3	479 62.1	306 73.8	1022 61.8
Total	181	97	26	165	777	414	1660 100.0

PART I — TABLE 17

FREQUENCY AND PERCENTAGE OF POSTNATAL EXAMINATIONS FOR YOUNGEST CHILD BY RESIDENCE AND PARTICIPATION STATUS

	PPNS in Village			No PPNS in Village			
Postnatal Visits	Family participates	Family does not participate	No knowledge of program	Family participates	Family does not participate	No knowledge of program	Total
Yes	80 41.4	33 33.5	3 12.1	63 37.5	201 25.0	82 20.2	462 27.2
No	101 58.6	64 66.5	23 87.9	102 62.5	578 75.1	332 79.8	1200 72.8
Total	181	97	26	165	779	414	1662 100.0

PART I — TABLE 18

FREQUENCY AND PERCENTAGE OF AGE IN MONTHS AT WHICH YOUNGEST WEANED CHILD STOPPED BREAST FEEDING BY RESIDENCE AND PARTICIPATION STATUS

	PPNS in Village			No PPNS in Village			
Age in Months	Family participates	Family does not participate	No knowledge of program	Family participates	Family does not participate	No knowledge of program	Total
1-6	4 7.0	8 12.9	2 29.0	8 10.8	28 8.4	22 11.5	72 10.2
7-12	6 10.2	4 8.3	1 16.4	6 9.9	26 7.8	12 5.8	55 7.7
13-18	13 18.6	10 19.1	0 0.0	12 17.6	55 15.9	22 11.1	112 15.1
19-24	36 53.3	26 48.4	3 38.2	37 55.7	193 57.9	110 59.4	405 56.4
25+	7 10.9	5 11.3	1 16.4	4 6.0	32 10.0	22 12.1	71 10.3
Total	66	53	7	67	334	188	715 100.0

PART I -- TABLE 19

FREQUENCY AND PERCENTAGE OF AGE IN MONTHS AT WHICH YOUNGEST CHILD RECEIVED SOLID FOOD BY RESIDENCE AND PARTICIPATION STATUS

	PPNS in Village			No PPNS in Village			
Age in Months	Family participates	Family does not participate	No knowledge of program	Family participates	Family does not participate	No knowledge of program	Total
1-6	90 67.7	38 62.4	14 73.3	71 62.2	322 61.0	160 59.0	699 62.0
7-12	36 25.2	18 29.1	5 26.7	37 30.2	172 33.7	86 33.3	355 31.6
13-18	5 3.3	3 5.1	0 0.0	1 1.0	9 1.8	6 2.2	24 2.9
19-24	5 3.7	2 3.3	0 0.0	7 6.0	16 2.9	14 5.3	44 3.8
25+	0 0.0	0 0.0	0 0.0	0 0.0	98 0.2	0 0.0	98 0.1
Total	136	61	19	116	519	266	1122 100.0

PART I — TABLE 20

FREQUENCY AND PERCENTAGE OF PRESENCE OF DIARRHEA IN YOUNGEST CHILD DURING TWO WEEKS PRIOR TO SURVEY BY RESIDENCE AND PARTICIPATION STATUS

	PPNS in Village			No PPNS in Village			
Presence of Diarrhea	Family participates	Family does not participate	No knowledge of program	Family participates	Family does not participate	No knowledge of program	Total
Yes	82 49.4	32 44.6	14 49.8	67 46.4	325 51.2	163 51.8	683 49.9
No	83 51.6	39 55.4	15 50.2	78 53.6	315 48.8	152 48.2	682 50.1
Total	165	71	29	145	640	315	1365 100.0

PART I — TABLE 21

FREQUENCY AND PERCENTAGE OF METHOD USED TO TREAT DIARRHEA IN YOUNGEST CHILD DURING PREVIOUS TWO WEEKS BY RESIDENCE AND PARTICIPATION STATUS

	PPNS in Village			No PPNS in Village			
Method	Family participates	Family does not participate	No knowledge of program	Family participates	Family does not participate	No knowledge of program	Total
Pain de singe	14 18.5	2 6.3	2 17.3	13 21.5	28 9.2	11 6.6	70 10.9
Sels de rehydration	2 2.8	0 0.0	1 6.4	1 1.3	6 1.6	1 0.5	11 1.5
I.V.	1 1.0	0 0.0	0 0.0	0 0.0	1 0.3	0 0.0	2 0.3
Medicament pharmaceutique autre que 2 et 3	45 52.3	16 51.8	6 43.9	32 46.6	165 49.4	92 56.7	356 51.3
Traitement traditionnel	4 4.9	2 7.7	1 6.7	4 5.8	17 5.4	14 8.4	42 6.3
Toute combination comprenant 1 ou 2 ou 3	0 0.0	1 2.5	0 0.0	0 0.0	0 0.0	0 0.0	1 0.1
Autre (treatment)	3 4.1	2 5.6	1 5.8	3 4.1	17 5.1	9 5.7	35 5.1
Pas de traitement	12 14.6	9 26.2	3 20.0	14 20.8	85 27.2	36 22.1	159 23.5
Ne se souvient pas	1 1.8	0 0.0	0 0.0	0 0.0	6 2.0	0 0.0	7 1.1
Total	82	32	14	67	325	163	683 100.0

PART I — TABLE 22

FREQUENCY AND PERCENTAGE OF FEVER, MALARIA TREATMENT AND PROPHYLAXES IN YOUNGEST CHILD DURING LAST WINTER BY RESIDENCE AND PARTICIPATION STATUS

	PPNS in Village			No PPNS in Village			
Fever, Treatment, Prophylaxes	Family participates	Family does not participate	No knowledge of program	Family participates	Family does not participate	No knowledge of program	Total
No Fever No Nivaquine	10 6.7	6 10.2	4 13.8	15 10.9	73 12.2	38 12.7	146 11.4
No Fever Preventive Nivaquine	21 14.0	4 6.8	0 0.0	10 7.3	26 4.3	5 1.7	66 5.2
Fever Nivaquine	103 68.7	37 62.7	16 55.2	89 64.5	358 59.8	163 54.5	766 60.1
Fever No Nivaquine	10 6.7	9 15.3	7 24.1	18 13.0	117 19.5	79 26.4	240 18.9
Don't know or remember	6 4.0	3 5.1	2 6.9	6 4.4	25 4.2	14 4.7	56 4.4
Total	150	59	29	138	599	299	1274 100.0

PART I — TABLE 23

FREQUENCY AND PERCENTAGE OF NUMBER OF DPT/POLIO IMMUNIZATIONS IN YOUNGEST CHILD BY RESIDENCE AND PARTICIPATION STATUS

	PPNS in Village			No PPNS in Village			
Number of Immuniza-tions	Family parti-cipates	Family does not parti-cipate	No knowledge of program	Family parti-cipates	Family does not parti-cipate	No knowledge of program	Total
0	152 87.0	61 82.9	28 97.5	135 83.6	616 95.5	307 97.0	1300 93.8
1	14 10.7	7 11.9	0 0.0	6 3.8	17 2.9	3 1.1	47 4.1
2	0 0.0	1 2.3	0 0.0	2 1.3	3 0.5	1 0.3	8 0.7
3	2 1.5	2 2.9	1 2.5	2 1.3	6 1.1	5 1.6	18 1.4
Total	168	71	29	146	642	316	1373 100.0

PART I — TABLE 24

FREQUENCY AND PERCENTAGE OF BCG VACCINATION STATUS IN YOUNGEST CHILD BY RESIDENCE AND PARTICIPATION STATUS

	PFNS in Village			No PFNS in Village			
Status	Family participates	Family does not participate	No knowledge of program	Family participates	Family does not participate	No knowledge of program	Total
Vaccinated	23 18.7	7 11.8	1 2.5	16 10.7	39 6.5	11 3.7	97 8.1
Not Vaccinated	145 81.3	64 88.2	28 97.5	130 89.3	605 93.5	305 96.3	1277 91.9
Total	168	71	29	146	644	316	1374 100.0

PART I — TABLE 25

FREQUENCY AND PERCENTAGE OF MEASLES VACCINATION STATUS IN YOUNGEST CHILD BY RESIDENCE AND PARTICIPATION STATUS

	PFNS in Village			No PFNS in Village			
Status	Family participates	Family does not participate	No knowledge of program	Family participates	Family does not participate	No knowledge of program	Total
Vaccinated	50 30.3	13 18.6	5 14.8	32 21.9	125 19.1	51 16.0	276 20.0
Not Vaccinated	119 69.7	58 81.4	24 85.3	114 78.1	519 80.9	265 84.0	1102 80.0
Total	169	71	29	146	644	316	1378 100.0

PART I — TABLE 26

FREQUENCY AND PERCENTAGE OF AGE OF ALL CHILDREN IN YEARS AT BY RESIDENCE AND PARTICIPATION STATUS

Age	PPHS in Village				No PPHS in Village								Total
					1-4 km to PPHS				5-10 km to PPHS				
	Present participation	Past participation	Non-participation	No knowledge of program	Present participation	Past participation	Non-participation	No knowledge of program	Present participation	Past participation	Non-participation	No knowledge of program	
0-1	23 10.6	1 1.9	57 29.9	9 22.5	10 15.9	1 2.2	88 20.5	26 22.6	5 17.9	0 0.0	131 18.5	86 22.2	437 19.2
1-2	47 24.8	0 0.0	29 17.6	9 23.1	13 21.6	2 4.5	75 17.2	17 14.8	7 23.9	1 5.7	137 19.8	66 16.5	403 18.2
2-3	36 18.7	5 14.3	24 15.1	5 18.2	20 31.3	6 15.4	63 15.1	20 17.1	1 9.1	2 9.1	125 18.0	66 17.0	375 17.0
3-4	45 20.9	9 27.1	31 17.7	5 18.3	8 12.9	7 16.8	85 19.5	17 15.1	7 19.6	4 23.5	107 15.0	70 18.1	395 17.6
4-5	38 20.1	9 25.2	18 10.9	6 21.9	8 14.8	16 38.5	65 14.9	18 15.7	7 20.2	10 48.7	116 16.9	58 14.9	367 16.7
5+	12 4.9	12 31.5	14 8.7	5 11.3	3 4.3	9 22.6	54 12.8	17 14.6	3 9.5	2 13.1	84 12.0	42 11.3	257 11.6
Total	204	36	173	42	62	41	425	115	32	19	700	388	2234 100.0

PART I -- TABLE 27

FREQUENCY AND PERCENTAGE OF PRESENCE OF DIARRHEA IN ALL CHILDREN DURING TWO WEEKS PRIOR TO SURVEY BY PARTICIPATION STATUS

	PPHS in Village				No PPHS in Village								
					1-4 hr to PPHS				5-30 hr to PPHS				
Presence of Diarrhea	Present participation	Past participation	Non-participation	No knowledge of program	Present participation	Past participation	Non-participation	No knowledge of program	Present participation	Past participation	Non-participation	No knowledge of program	Total
Yes	80 40.0	6 16.2	62 37.2	22 34.1	29 46.2	10 28.6	175 41.7	42 36.8	9 33.3	3 15.8	269 39.9	172 45.9	879 40.5
No	118 60.0	27 83.9	107 62.8	20 65.9	33 53.8	25 72.8	240 58.3	72 64.0	23 66.7	15 86.2	417 60.1	203 54.1	1300 59.5
Total	198	33	169	42	62	35	415	114	32	18	686	375	2179 100.0

PART I -- TABLE 28

FREQUENCY AND PERCENTAGE OF METHOD OF TREATMENT OF DIARRHEA IN ALL CHILDREN DURING TWO WEEKS PRIOR TO SURVEY BY PARTICIPATION STATUS

Method	PPHS in Village				No PPHS in Village								Total
					1-4 km to PPHS				5-10 km to PPHS				
	Present participation	Past participation	Non-participation	No knowledge of program	Present participation	Past participation	Non-participation	No knowledge of program	Present participation	Past participation	Non-participation	No knowledge of program	
Pain de singe	15 18.5	1 22.8	5 9.4	2 11.2	6 28.1	0 0.0	17 10.1	3 6.5	2 22.4	0 0.0	22 8.3	10 5.4	83 9.6
Sels de réhydration	0 0.0	0 0.0	2 4.0	0 0.0	0 0.0	1 6.3	3 1.5	3 6.9	0 0.0	0 0.0	7 2.2	1 0.6	17 1.8
I.V.	1 1.1	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	1 0.5	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	2 0.2
Médicament pharmaceutique autre que 2 et 3	50 60.9	2 22.4	24 52.0	14 63.3	18 60.0	6 30.4	80 43.7	27 62.7	5 49.1	1 28.1	144 49.3	100 55.4	481 51.8
Traitement traditionnel	3 3.3	0 0.0	4 7.0	1 4.3	0 0.0	0 0.0	13 7.1	0 0.0	0 0.0	1 22.2	16 5.6	15 8.0	51 5.7
Toute combinaison composant 1 ou 2 ou 3	0 0.0	0 0.0	1 1.2	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	1 0.1
Autre (traitement)	3 4.2	0 0.0	1 1.4	1 3.7	2 6.2	1 4.3	12 4.6	2 4.7	0 0.0	0 0.0	11 4.0	6 3.6	39 4.2
Pas de traitement	7 10.2	3 42.3	14 19.6	4 17.5	4 12.8	2 14.5	47 27.1	8 19.1	2 28.3	1 21.7	64 23.0	40 22.3	190 22.1
Ne se souvient pas	1 1.8	1 11.5	3 5.5	0 0.0	0 0.0	5 33.5	6 3.5	0 0.0	0 0.0	1 28.1	16 5.6	9 4.8	42 4.6
Total	80	7	64	22	30	15	179	43	9	4	280	181	914 100.0

PART I -- TABLE 29

FREQUENCY AND PERCENTAGE OF METHOD OF TREATMENT OF MALARIA AND PROPHYLAXIS IN ALL CHILDREN DURING THE WEEK PRIOR TO SURVEY BY PARTICIPATION STATUS

Fever, Treatment, Prophylaxis	PPHS in Village				No PPHS in Village								Total
					1-4 hr to PPHS				5-30 hr to PPHS				
	Present participation	Past participation	Non-participation	No knowledge of program	Present participation	Past participation	Non-participation	No knowledge of program	Present participation	Past participation	Non-participation	No knowledge of program	
No Fever No Mloquine	5 2.2	1 2.5	17 10.3	3 7.6	4 5.5	1 2.2	29 7.0	16 14.7	5 15.6	1 4.5	73 11.1	32 9.2	187 8.8
No Fever Preventive Mloquine	33 14.1	2 4.8	8 5.6	0 0.0	6 9.5	4 9.2	21 5.5	1 0.7	0 0.0	1 5.8	24 3.5	4 1.0	104 4.8
Fever Mloquine	166 76.1	26 74.5	98 66.6	23 53.7	49 81.0	23 58.9	264 66.6	73 67.0	18 55.7	9 49.0	391 58.5	215 57.5	1395 63.2
Fever No Mloquine	9 4.5	5 11.9	16 10.0	14 34.0	1 4.1	5 10.9	69 17.0	17 15.8	8 28.7	6 28.8	148 22.4	95 24.2	395 18.2
Don't know or remember	2 2.2	2 6.4	10 7.6	2 4.8	0 0.0	8 18.8	17 4.8	2 1.8	0 0.0	2 11.9	32 4.5	30 8.1	107 5.1
Total	395	36	149	42	62	41	668	109	31	19	668	376	2128 100.0

PART I -- TABLE 20

FREQUENCY AND PERCENTAGE OF NUMBER OF DPT/POLIO IMMUNIZATIONS IN ALL CHILDREN BY PARTICIPATION STATUS

Number	PPHS in Village				No PPHS in Village								Total
					1-4 hm to PPHS				5-30 hm to PPHS				
	Present participation	Past participation	Non-participation	No knowledge of program	Present participation	Past participation	Non-participation	No knowledge of program	Present participation	Past participation	Non-participation	No knowledge of program	
0	174 83.3	31 83.3	158 87.9	37 90.0	50 80.0	33 82.6	392 91.9	104 88.1	31 96.7	19 100.0	662 94.3	369 97.0	2057 91.6
1	19 12.3	2 6.8	10 7.9	1 2.4	5 8.0	3 6.9	20 4.0	9 8.0	0 0.0	0 0.0	19 3.2	3 0.9	91 4.8
2	4 2.4	1 2.5	1 0.9	1 2.4	3 6.4	2 5.3	4 0.9	1 1.0	1 3.3	0 0.0	3 0.5	2 0.5	23 1.1
3	4 2.0	2 7.4	3 2.3	3 5.3	3 4.5	2 5.2	7 1.9	4 2.0	0 0.0	0 0.0	12 2.0	6 1.6	48 2.3
4	0 0.0	0 0.0	0 0.0	0 0.0	2 3.2	0 0.0	2 0.5	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	4 0.2
Total	201	36	174	42	63	40	425	115	32	19	696	380	2223 100.0

PART I — TABLE 31

FREQUENCY AND PERCENTAGE OF PRESENCE OF DCC IMMUNIZATION STATUS IN ALL CHILDREN BY PARTICIPATION STATUS

DCC Immunization	PFHS in Village				No PFHS in Village								Total
					1-4 km to PFHS				5-10 km to PFHS				
	Present participation	Past participation	Non-participation	No knowledge of program	Present participation	Past participation	Non-participation	No knowledge of program	Present participation	Past participation	Non-participation	No knowledge of program	
Yes	30 18.8	5 21.8	23 16.4	8 17.8	9 13.8	11 27.5	34 8.4	7 5.4	4 13.9	2 10.2	31 8.1	23 6.3	207 10.4
No	170 81.2	31 79.8	151 83.6	34 83.8	34 87.8	29 72.8	390 81.6	108 94.6	28 86.1	17 89.8	648 91.9	357 93.7	2017 89.6
Total	200	36	174	42	63	48	424	115	32	19	699	380	2224 100.0

PART I — TABLE 33

FREQUENCY AND PERCENTAGE OF PRESENCE OF MEASLES VACCINE STATUS IN ALL CHILDREN BY PARTICIPATION STATUS

Measles Vaccine	PPHS in Village				No PPHS in Village								Total
					1-4 km to PPHS				5-30 km to PPHS				
	Present participation	Past participation	Non-participation	No knowledge of program	Present participation	Past participation	Non-participation	No knowledge of program	Present participation	Past participation	Non-participation	No knowledge of program	
Yes	88 42.9	24 66.8	47 27.2	14 38.1	19 30.8	23 55.9	123 29.3	33 28.5	12 37.4	7 35.8	169 22.9	64 17.1	625 27.5
No	113 57.1	12 34.8	127 72.8	28 69.9	44 78.8	17 44.1	300 70.7	82 71.5	20 62.6	12 65.8	534 77.1	316 82.9	1602 72.5
Total	201	36	174	42	63	40	425	115	32	19	700	380	2227 100.0

PART I — TABLE 33

TOTAL FREQUENCY AND WEIGHTED PERCENTAGE OF RECENT[a] INCIDENCE OF DIARRHEA IN CHILDREN BY AGE OF CHILD, VILLAGE AND PARTICIPATION STATUS

Age in Months	n/%	PPNS Village			1-4 km from PPNS			5-30 km from PPNS			Total[b]
		Present participation	Non-participation	No knowledge of program	Present participation	Non-participation	No knowledge of program	Present participation	Non-participation	No knowledge of program	
<12	%	69.8	41.3	43.5	60.6	46.7	44.3	44.5	54.8	55.7	51.6
	n	25	61	11	10	94	26	6	133	87	455
12-23	%	51.9	59.4	75.8	48.3	59.2	69.4	71.2	53.9	63.9	57.9
	n	47	26	7	14	73	19	6	132	69	396
24-35	%	45.0	41.3	66.8	66.4	49.5	31.9	37.1	38.5	43.7	43.6
	n	36	23	5	18	57	18	3	118	58	347
36-47	%	25.3	38.7	71.3	21.7	39.6	30.3	12.9	41.1	42.0	36.6
	n	36	22	3	8	68	17	7	96	61	334
48-59	%	23.9	16.5	48.6	27.9	32.7	21.1	0.0	21.9	28.4	23.3
	n	35	18	8	8	49	17	7	101	46	318
60+	%	0.0	10.7	22.3	0.0	10.0	13.7	48.6	22.9	26.0	18.1
	n	9	12	5	3	37	15	2	67	35	202

[a]during two weeks prior to interview
[b]also includes past participants

PART I — TABLE 34

FREQUENCY AND WEIGHTED PERCENTAGE OF INCIDENCE OF RECENT* DIARRHEA AMONG CHILDREN IN PPNS AND NON-PPNS VILLAGES BY AGE

Age in Months	freq/%	PPNS Villages			Non-PPNS Villages			Total		
		Yes	No	Total	Yes	No	Total	Yes	No	Total
<3	freq	15	22	37	46	83	129	61	105	166
	%	41.5	58.5	100.0	37.7	62.3	100.0	38.6	61.4	100.0
3-5	freq	9	17	26	69	46	115	78	63	141
	%	33.0	67.0	100.0	60.9	39.1	100.0	55.1	44.9	100.0
6-8	freq	10	6	16	37	22	59	47	28	75
	%	65.1	34.9	100.0	61.4	38.6	100.0	62.1	37.9	100.0
9-11	freq	15	7	22	47	28	75	62	35	97
	%	64.5	35.5	100.0	59.9	40.1	100.0	61.2	38.8	100.0
12-17	freq	35	22	57	116	94	210	151	117	268
	%	62.0	38.0	100.0	56.0	44.0	100.0	57.2	42.8	100.0
18-23	freq	15	12	27	66	46	112	81	58	139
	%	51.6	48.4	100.0	60.9	39.1	100.0	58.7	41.3	100.0
24-35	freq	32	39	71	124	162	286	156	202	358
	%	45.3	54.7	100.0	42.6	57.4	100.0	43.1	56.9	100.0
36-47	freq	22	51	73	104	171	275	126	224	350
	%	29.4	70.6	100.0	38.4	61.6	100.0	36.0	64.0	100.0
48-59	freq	15	56	71	61	194	255	76	250	326
	%	21.4	78.6	100.0	24.0	76.0	100.0	23.4	76.6	100.0
60+	freq	6	33	39	30	141	171	36	175	211
	%	14.7	85.3	100.0	18.7	81.3	100.0	17.8	82.2	100.0

*during two weeks prior to interview

PART I — TABLE 35

TOTAL FREQUENCY AND WEIGHTED PERCENTAGE OF RECENT* INCIDENCE OF DIARRHEA IN CHILDREN BY AGE OF CHILD AND TYPE OF HOUSE

Age of child in months	%/n	Type of House: Modern	Semi Modern	Semi Traditional	Traditional	Total
<12	%	53.2	59.0	49.9	48.2	51.7
	n	47	90	278	64	479
12-23	%	52.6	61.1	60.3	48.8	57.7
	n	46	64	234	63	407
24-35	%	37.9	44.8	48.1	24.4	43.1
	n	40	61	211	46	358
36-47	%	21.1	37.7	40.0	34.5	36.0
	n	44	63	192	51	350
48-59	%	15.8	21.3	23.8	29.7	23.3
	n	35	59	178	54	326
60+	%	6.7	11.8	19.2	24.2	17.8
	n	23	34	106	48	211

*during two weeks prior to interview

172

PART I — TABLE 36

TOTAL FREQUENCY AND WEIGHTED PERCENTAGE OF CHILDREN WITH RECENT DIARRHEA BY AGE AND SEX

Age in Months	Males		Females		Total	
	n	%	n	%	n	%
<3	80	39.8	86	37.4	166	38.6
3-5	78	59.1	63	50.3	141	55.1
6-8	41	69.7	34	52.6	75	62.1
9-11	46	74.0	51	49.2	97	61.2
12-17	133	60.1	135	54.4	268	57.2
18-23	75	65.0	64	50.5	139	58.7
24-35	170	46.5	188	40.0	358	43.1
36-47	192	37.1	158	34.8	350	36.0
48-59	175	25.7	151	23.0	326	23.4
60+	127	18.7	84	16.3	211	17.8
Total	1183	42.3	1079	38.1	2262	40.3

PART I — TABLE 37

TOTAL FREQUENCY* AND PERCENTAGE BELOW EMPIRICALLY DEFINED CUTPOINTS FOR MALNUTRITION† FOR FIVE ANTHROPOMETRIC MEASURES FOR ALL CHILDREN BY SEX AND AGE

Age in Months	%/n	Weight for Age		Weight for Height		Height for Age		Arm Circumference for Age		Arm Circumference for Height	
		Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
<3	%	1.3	3.4	6.3	11.1	1.5	1.4	1.5	1.4	4.5	2.7
	n	78	85	64	72	66	73	66	73	66	74
3-5	%	1.1	0.0	9.3	6.6	0.0	0.0	2.6	4.8	4.0	8.1
	n	78	63	75	61	75	62	76	62	75	62
6-8	%	5.2	9.4	19.5	18.2	2.4	0.0	14.6	15.2	12.2	9.1
	n	41	34	41	33	41	33	41	33	41	33
9-11	%	18.2	11.1	28.9	10.2	2.2	0.0	20.0	20.0	11.1	12.2
	n	46	52	45	49	45	49	45	50	45	49
12-17	%	19.9	11.8	20.8	16.5	5.4	5.2	22.7	23.1	14.6	18.7
	n	133	135	130	133	130	134	132	134	130	134
18-23	%	23.7	24.5	19.4	17.7	20.8	24.2	11.1	21.0	6.9	19.4
	n	76	66	72	62	72	62	72	62	72	62
24-35	%	21.1	17.9	14.6	16.1	21.3	18.9	22.6	14.4	17.1	19.4
	n	172	192	164	180	164	180	164	181	164	180
36-47	%	9.7	11.8	8.1	7.5	13.5	20.3	8.1	3.4	8.1	8.2
	n	200	172	185	147	185	148	186	147	185	147
48-59	%	5.2	5.5	4.3	4.3	14.0	12.1	6.6	3.6	7.9	10.6
	n	179	162	164	141	164	141	166	142	164	141
60+	%	6.2	6.0	9.5	2.5	9.5	7.4	3.5	4.9	6.0	4.9
	n	133	92	116	81	116	81	116	81	116	81
Total	%	11.5	10.8	12.1	10.5	11.3	11.4	11.6	11.0	10.0	12.7
	n	1099	1053	1117	1016	1058	963	1064	965	1119	1020

*i.e., sample size

†see Appendix C for actual values and rationale for selection of these cutpoints.

PART I — TABLE 38A

TOTAL FREQUENCY AND WEIGHTED PERCENTAGE OF CHILDREN BELOW 70 PERCENT OF REFERENCE FOR WEIGHT FOR AGE BY AGE AND PARTICIPATION STATUS

Age in Months	PPNS in Village				No PPNS in Village							
					1-4 km to PPNS				5-30 km to PPNS			
	Present participation	Past participation	Non-participation	No knowledge of program	Present participation	Past participation	Non-participation	No knowledge of program	Present participation	Past participation	Non-participation	No knowledge of program
<12	26 3.8	1 0.0	60 1.3	11 0.0	10 22.0	1 0.0	93 6.8	26 7.6	6 11.8	0 —	132 4.7	87 5.4
12-23	47 11.5	0 —	27 10.1	7 58.0	14 14.4	2 0.0	74 26.2	19 19.0	6 0.0	1 0.0	133 20.5	69 19.4
24-35	36 8.9	5 0.0	23 13.3	5 44.7	18 10.1	6 0.0	58 28.1	19 15.6	3 37.1	2 100.0	120 13.4	58 35.0
36-47	38 4.7	8 0.0	23 0.0	3 0.0	8 0.0	5 0.0	72 13.3	17 21.1	7 0.0	4 24.7	99 13.3	61 14.9
48-59	35 0.0	8 0.0	18 0.0	8 24.4	8 0.0	14 12.9	52 3.7	17 0.0	7 27.1	9 0.0	104 8.7	49 4.0
60+	9 8.9	9 0.0	12 6.6	5 0.0	3 0.0	7 0.0	38 10.0	15 17.4	2 0.0	2 0.0	70 4.4	36 5.6
Total	191 6.4	31 0.0	163 4.7	39 22.5	61 9.8	35 5.0	387 14.8	113 13.0	31 11.6	18 15.6	658 11.4	360 14.2

PART I — TABLE 38B

TOTAL FREQUENCY AND WEIGHTED PERCENTAGE OF CHILDREN BELOW 70 PERCENT OF REFERENCE FOR WEIGHT FOR HEIGHT BY AGE AND PARTICIPATION STATUS

	PPNS in Village				No PPNS in Village							
					1-4 km to PPNS				5-30 km to PPNS			
Age in Months	Present participation	Past participation	Non-participation	No knowledge of program	Present participation	Past participation	Non-participation	No knowledge of program	Present participation	Past participation	Non-participation	No knowledge of program
<12	25 11.2	1 0.0	56 6.9	9 18.5	10 29.8	1 0.0	85 15.4	22 4.7	6 0.0	0 —	125 13.9	78 14.8
12-23	46 27.0	0 —	25 23.8	7 0.0	13 22.1	2 0.0	72 19.5	18 89.2	5 0.0	1 0.0	130 17.9	69 18.4
24-35	36 5.5	4 0.0	22 6.7	5 44.5	18 15.2	3 0.0	54 23.1	17 12.8	3 68.6	2 50.6	114 11.2	56 19.1
36-47	36 2.0	8 0.0	21 11.2	2 0.0	8 0.0	4 0.0	64 4.6	14 15.4	7 0.0	2 10.0	93 7.6	59 11.5
48-59	33 2.9	8 0.0	18 0.0	8 24.4	8 0.0	12 7.7	43 2.7	15 0.0	7 0.0	9 0.0	92 5.4	46 7.0
60+	9 8.9	8 19.5	9 0.0	5 22.3	2 0.0	5 25.6	35 8.1	14 0.0	2 0.0	2 0.0	64 6.2	32 3.3
Total	193 10.5	32 5.1	159 8.6	36 19.6	61 13.9	32 9.8	384 12.6	102 6.9	30 6.6	17 18.4	653 10.9	357 13.2

PART I — TABLE 39

FREQUENCY AND PERCENTAGE DISTRIBUTIONS FOR WEIGHT FOR AGE PERCENT OF REFERENCE BY AGE FOR PARTICIPANTS AND NON-PARTICIPANTS IN PPNS VILLAGES

Age in Months	Weight for age % Median	Participants in PPNS Villages		Non-participants in PPNS Villages		Total	
		Freq	%	Freq	%	Freq	%
<6	<70	0	0.0	0	0.0	0	0.0
	>70	9	100.0	44	100.0	53	100.0
	Total	9	100.0	44	100.0	53	100.0
6-11	<70	1	5.9	1	6.3	2	6.1
	>70	16	94.1	15	93.7	31	93.9
	Total	17	100.0	16	100.0	33	100.0
12-17	<70	2	7.1	3	14.3	5	10.2
	>70	26	92.9	18	85.7	44	89.8
	Total	28	100.0	21	100.0	49	100.0
18-23	<70	4	21.0	0	0.0	4	16.0
	>70	15	79.0	6	100.0	21	84.0
	Total	19	100.0	6	100.0	25	100.0
24-29	<70	0	0.0	1	8.3	1	4.2
	>70	12	100.0	11	91.7	23	95.8
	Total	12	100.0	12	100.0	24	100.0
30-35	<70	4	16.7	2	18.2	6	17.1
	>70	20	83.3	9	87.8	29	82.9
	Total	24	100.0	11	100.0	35	100.0
36+	<70	3	3.7	1	1.9	4	3.0
	>70	79	96.3	52	98.1	131	97.0
	Total	82	100.0	53	100.0	135	100.0

Homogeneity of association across strata $\chi^2_6 = 3.46$, $p >> 0.10$

Overall degree of association $\chi^2_1 = 0.00$, $p > 0.99$

PART I — TABLE 40

TOTAL FREQUENCY AND WEIGHTED PERCENTAGE OF INCIDENCE OF RECENT DIARRHEA FOR ALL CHILDREN BY AGE AND PERCENTAGE OF REFERENCE FOR FIVE ANTHROPOMETRIC MEASURES

Anthropometric Measure	% of Median *	Months of Age <12 n	<12 %	12-23 n	12-23 %	24-35 n	24-35 %	35-47 n	35-47 %	48-59 n	48-59 %	60+ n	60+ %
Weight for Age	<70	24	60.7	78	56.3	72	55.6	41	47.8	18	35.3	14	33.0
	≥70	451	51.7	329	58.1	286	40.0	309	34.6	308	22.7	197	16.8
Weight for Height	<84.66	55	53.7	74	58.2	53	64.7	76	38.7	13	19.7	13	24.2
	≥84.66	383	52.7	323	57.2	291	39.9	305	37.0	291	23.2	182	17.0
Height for Age	<85.25	4	47.9	44	59.1	69	45.9	55	48.7	40	33.9	17	35.3
	≥85.25	438	53.1	354	57.1	275	43.0	277	34.8	264	21.3	178	16.2
Arm Circumference for Age	<79.10	37	71.3	82	61.4	63	58.4	20	54.1	19	27.4	6	0.0
	≥79.10	407	51.4	318	56.5	282	40.4	312	35.9	288	23.1	189	18.0
Arm Circumference for Height	<83.49	32	56.3	61	62.7	63	54.3	27	46.9	28	22.4	9	0.0
	≥83.49	411	52.7	337	56.3	281	41.3	304	36.2	276	23.1	186	18.3

*The rationale for the selection of these cutpoints is explained in Appendix

PART I — TABLE 41

RESULTS OF STEPWISE DISCRIMINANT ANALYSES TO INVESTIGATE MULTIVARIATE RELATIONSHIPS OF VARIOUS CLASSIFICATION DICHOTOMIES* AMONG CHILDREN IN PFNS VILLAGES PARTICIPANTS AND NONPARTICIPANTS

Classification Variable	Step	Independent Variable†	Partial R^2	F-ratio	Prob.	n
Recent Diarrhea	1	Age in months	0.074	25.09	0.0001	318
	2	Religion	0.020	6.55	0.0110	
Weight for Age Class	-	none				
<70% median						
≥70% median						
Weight for Height Class	1	Recent diarrhea	0.017	5.11	0.0245	302
<84.66% median						
≥84.66% median						
Height for Age Class	1	Age in months	0.032	9.81	0.0019	301
<84.25% median						
≥84.25% median						
Arm Circumference for Age Class	1	Sex	0.013	4.04	0.0452	302
<79.10% median						
≥79.10% median						
Arm Circumference for Height Class	1	Sex	0.033	10.19	0.0016	301
	2	Age in months	0.027	8.33	0.0042	
<83.49% median	3	Time in program	0.027	8.20	0.0045	
≥83.49% median						

*See appendix C for rationale for selection of these values

†The independent variables for predicting anthropometric classes were:

religion
type of house
mother's age
mother's French reading literacy
sex
time in program
age in months
recent diarrhea
birth order

PART I — TABLE 42

RESULTS OF MULTIPLE REGRESSION ANALYSES INVESTIGATING RELATIONSHIPS OF VARIOUS FACTORS WITH INDIVIDUAL ANTHROPOMETRIC MEASURES AMONG PARTICIPANT AND NON-PARTICIPANT CHILDREN IN PPNS VILLAGES

Dependent Variable	Step	Independent Variable*	Summary F-ratio	Prob.	Stepwise Regression F-ratio	Prob.	R^2
Weight for Age z-score (n=303)	1	Age	37.12	0.0001	20.63	0.0003	0.0386
	2	Age (squared)	25.18	0.0001	16.01	0.0001	0.0774
	3	Recent diarrhea	6.09	0.0142	13.09	0.0001	0.1384
Weight for Height z-score (n=302)	-	None					
Height for Age z-score (n=301)	1	Age	38.69	0.0001	29.70	0.0001	0.0904
	2	Age (squared)	21.22	0.0001	27.49	0.0001	0.1558
	3	Recent diarrhea	6.91	0.0090	20.99	0.0001	0.1750
Arm Circumference for Height z-score (n=275)	1	Age (squared)	4.29	0.0393	4.29	0.0393	0.0155
Arm Circumference for Age z-score (n=302)	1	Age	49.68	0.0001	9.56	0.0022	0.0307
	2	Age (squared)	40.99	0.0001	25.88	0.0001	0.1476

Regression Equations:

$WAZ = -0.0715 - 0.0789*Age + 0.0010*Age^2 - 0.1788*Diarrhea(yes)$

$HAZ = 0.2299 - 0.1002*Age + 0.0011*Age^2 - 0.2361*Diarrhea(yes)$

$AHZ = -0.8379 - 0.0005*Age^2$

$AAZ = -0.2243 - 0.0783*Age + 0.0011*Age^2$

*The independent variables were:

religion
type of house
mother's age
mother's French reading literacy
sex
age
age (squared)
recent diarrhea
time in program

PART I — TABLE 43

SELECTED SURVIVAL ANALYSIS RESULTS

NUMBERS OF CHILDREN ENTERING (ℓ_i) AND DYING (d_i) IN AGE INTERVAL
AND ESTIMATED CUMULATIVE PROBABILITY OF SURVIVAL TO BEGINNING OF INTERVAL

	PPHS Villages						Non-PPHS Villages					
Age Interval (in months)	Participants		Non-Participants		No knowledge of program		Participants		Non-Participants		No knowledge of program	
	ℓ_i/d_i	$\hat{P}_{0i}$	ℓ_i/d_i	$\hat{P}_{0i}$	ℓ_i/d_i	$\hat{P}_{0i}$	ℓ_i/d_i	$\hat{P}_{0i}$	ℓ_i/d_i	$\hat{P}_{0i}$	ℓ_i/d_i	$\hat{P}_{0i}$
0-1	337/6	1.0000	121/2	1.0000	50/1	1.0000	290/8	1.0000	1239/25	1.0000	648/34	1.0000
1-6	326/5	0.9821	114/2	0.9831	48/4	0.9798	278/4	0.9722	1181/28	0.9796	594/15	0.9467
6-12	293/2	0.9662	96/3	0.9650	40/0	0.8969	250/2	0.9572	1041/25	0.9554	527/14	0.9214
12-18	259/3	0.9593	84/4	0.9339	34/2	0.8969	231/4	0.9493	926/28	0.9319	464/18	0.8960
18-24	224/2	0.9475	69/1	0.8863	28/0	0.8409	198/1	0.9317	739/15	0.9020	395/ 9	0.8592
24-36	199/8	0.9386	63/1	0.8729	27/2	0.8409	183/8	0.9268	702/27	0.8841	348/25	0.8386
36-48	141/2	0.8954	48/1	0.8574	20/0	0.7722	122/2	0.8795	503/10	0.8453	231/ 8	0.7692
48-60	84/1	0.8796	25/0	0.8342	15/1	0.7722	77/1	0.8620	300/ 7	0.8245	135/ 2	0.7363
60+	25/0	0.8636	11/3	0.8342	5/0	0.6987	28/1	0.8457	129/ 1	0.7980	58/ 1	0.7212

PART I -- TABLE 44

ESTIMATED PROBABILITY OF DEATH ($\hat{q}_1$) AND AGE-SPECIFIC MORTALITY RATIOS (mr)
BY AGE AND PARTICIPATION STATUS

Age Interval (in months)	PPNS Villages						Non-PPNS Villages					
	Participants		Non-Participants		No knowledge of program		Participants		Non-Participants		No knowledge of program	
	$\hat{q}_1$	mr	$\hat{q}_1$	mr	$\hat{q}_1$	mr	$\hat{q}_1$	mr	$\hat{q}_1$	mr	$\hat{q}_1$	mr
0-1	0.0179	--	0.0169	0.94	0.0202	1.20	0.0278	1.55	0.0204	1.14	0.0533	2.98
1-6	0.0062	--	0.0184	1.14	0.0846	5.22	0.0154	0.95	0.0247	1.52	0.0267	1.65
6-12	0.0071	--	0.0322	4.54	0.0000	0.00	0.0083	1.17	0.0246	3.46	0.0276	3.89
12-18	0.0123	--	0.0510	4.15	0.0625	5.08	0.0185	1.50	0.0321	2.61	0.0411	3.34
18-24	0.0094	--	0.0151	1.61	0.0000	0.00	0.0053	0.56	0.0198	2.11	0.0239	2.54
24-36	0.0460	--	0.0178	0.39	0.0816	1.77	0.0510	1.11	0.0439	0.95	0.0829	1.80
36-48	0.0176	--	0.0271	1.54	0.0000	0.00	0.0199	1.13	0.0246	1.40	0.0428	2.43
48-60	0.0182	--	0.0000	0.00	0.0952	5.23	0.0189	1.04	0.0321	1.76	0.0205	1.13

mr = $\hat{q}_1$ for category ÷ q_1 for participants in PPNS villages

PART II — TABLE 1

FREQUENCY DISTRIBUTION OF CENTERS BY TYPE OF CENTER AND REGION

Type of Center	Region							Total
	Cap Vert	Casamance	Diourbel	Fleuve	Louga	Senegal Oriental	Sine Saloum	
Dispensaire	3	35	9	38	11	6	19	121
Maternite	0	2	1	2	1	0	1	7
Centre Social	2	3	0	0	1	0	3	9
Religieux	2	7	0	0	1	1	1	12
CER	0	1	0	0	0	0	0	1
Maisons familiales	0	1	0	0	0	0	0	1
Total	7	49	10	40	14	7	24	151

PART II — TABLE 2

FREQUENCY DISTRIBUTION OF CENTERS BY LOCATION AND REGION

Location*	Region							Total
	Cap Vert	Casamance	Diourbel	Fleuve	Louga	Senegal Oriental	Sine Saloum	
Urban	7	3	0	0	4	1	0	15
Semi-urban	0	9	2	4	5	2	12	34
Village	0	37	8	36	5	4	12	102
Total	7	49	10	40	14	7	24	151

*Urban = pop. > 25,000

Semi-urban = 3,000 $\leq$ pop. $\leq$ 25,000

Village = pop. $\leq$ 3,000

PART II — TABLE 3

FREQUENCY DISTRIBUTION OF CENTERS BY FOOD AVAILABILITY RATING AND REGION

Food Availability Rating	Region							Total
	Cap Vert	Casamance	Diourbel	Fleuve	Louga	Senegal Oriental	Sine Saloum	
1	0	7	0	0	4	0	0	11
2	0	8	0	12	2	0	0	22
3	0	1	0	6	0	5	0	12
4	0	16	2	21	7	0	0	46
5	7	17	8	1	1	2	24	60
Total	7	49	10	40	14	7	24	131

PART II — TABLE 4

FREQUENCY DISTRIBUTION OF CENTERS BY MONTHS OF RUPTURE AND REGION

Months of Rupture	Region							Total
	Cap Vert	Casamance	Diourbel	Fleuve	Louga	Senegal Oriental	Sine Saloum	
0	0	19	5	14	2	0	9	49
1	1	13	3	9	4	3	7	40
2	3	8	2	3	4	1	3	24
3	2	5	0	9	3	2	3	24
4	0	3	0	4	0	1	2	10
5	1	1	0	1	1	0	0	4
Total	7	49	10	40	14	7	24	151

PART II — TABLE 5

FREQUENCY AND PERCENTAGE DISTRIBUTIONS OF CENTERS
BY NUMBER OF MONTHS OF RUPTURE AND LOCATION OF CENTER

Months of Rupture	Location*							
	Urban		Semi-urban		Villages		Total	
	Freq	%	Freq	%	Freq	%	Freq	%
0	0	0.0	12	35.3	37	36.3	49	32.5
1	4	26.7	12	35.3	24	23.5	40	26.5
2	6	40.0	5	14.7	13	12.7	24	15.9
3	3	20.0	4	11.8	17	16.7	24	15.9
4	1	6.7	1	2.9	8	7.8	10	6.6
5	1	6.7	0	0.0	3	2.9	4	2.6
Total	15	100.0	34	100.0	102	100.0	151	100.0

*Urban = pop. > 25,000

Semi-urban = 3,000 $\leq$ pop. $\leq$ 25,000

Village = pop. $\leq$ 3,000

PART II — TABLE 6

FREQUENCY DISTRIBUTION OF CENTERS
BY MONTHS OF RUPTURE AND FOOD AVAILABILITY RATING

Months of Rupture	Food Availability*					Total
	0	1-25	26-49	50-99	100+	
0	4	6	3	16	20	49
1	2	5	1	13	19	40
2	1	3	2	7	11	24
3	3	6	4	5	6	24
4	1	0	2	4	3	10
5	0	2	0	1	1	4
Total	11	22	12	46	60	151

*kilograms per person surplus

PART II — TABLE 7A

AVERAGE NUMBER OF KILOGRAMS* OF VARIOUS COMMODITIES DISTRIBUTED DURING APRIL-DECEMBER 1981 AND NUMBER OF CENTERS REPORTING, BY REGION, FOR 151 CENTERS

Region	Type of Food	April	May	June	July	August	Sept	Oct	Nov	Dec
Cap Vert	CSM	0.52	1.60	1.61	2.80	2.68	4.09	4.09	3.68	2.11
	S	0.52	1.60	1.08	0.85	0.0	0.62	1.70	0.98	0.46
	C	0.0	0.0	0.53	2.01	2.57	3.46	2.39	2.50	2.04
	Total†	1.04	3.20	3.23	5.66	5.25	8.18	8.19	6.97	4.61
Casamance	CSM	3.29	3.68	3.92	4.30	3.84	3.97	3.67	2.56	1.86
	S	3.24	3.52	3.75	4.03	3.78	3.77	3.78	2.60	1.59
	C	0.0	0.0	0.0	0.0	0.0	0.07	0.07	0.18	1.45
	Total	6.54	7.21	7.68	8.34	7.63	7.82	7.54	5.34	4.91
Diourbel	CSM	3.24	2.53	3.15	3.78	3.77	3.58	2.62	3.82	3.79
	S	3.24	2.84	0.64	0.46	0.16	0.0	0.0	0.36	0.37
	C	0.0	0.0	2.66	2.92	3.60	3.53	2.52	3.45	3.42
	Total	6.48	5.38	6.46	7.17	7.54	7.11	5.15	7.65	7.58
Fleuve	CSM	2.64	2.78	3.18	4.08	4.12	3.86	3.90	2.29	0.65
	S	2.53	2.79	2.82	1.53	0.64	0.58	0.46	0.14	0.20
	C	0.0	0.0	0.11	2.54	3.45	3.33	3.35	2.22	0.94
	Total	5.17	5.58	6.12	8.17	8.22	7.77	7.72	4.67	1.80
Louga	CSM	1.82	1.60	3 92	3.77	3.59	3.59	3.47	3.66	3.21
	S	1.83	1.60	3.88	2.69	—§	3.74	3.90	3.96	1.30
	C	0.0	0.0	3.69	3.55	3.56	3.57	3.56	3.57	2.91
	Total	3.65	3.20	11.49	10.01	—	10.92	10.93	11.19	7.42
Senegal Oriental	CSM	0.0	1.71	3.79	3.19	2.60	4.08	2.26	3.05	3.22
	S	0.0	1.97	3.55	2.30	1.22	4.65	0.39	2.72	1.84
	C	0.0	0.0	2.53	2.87	2.42	4.33	1.99	2.19	3.14
	Total	0.0	3.68	9.87	3.36	6.24	13.06	4.64	7.96	8.20
Sine Saloum	CSM	0.65	2.26	2.19	3.74	3.89	3.76	3.33	2.87	3.12
	S	0.62	2.33	1.91	2.81	2.95	3.70	2.05	1.82	3.07
	C	0.0	0.0	1.12	3.77	3.75	3.62	3.24	2.49	3.59
	Total	1.27	4.59	5.22	10.32	10.59	11.08	8.62	7.18	9.78
All Regions	CSM	2.26	2.78	3.28	3.95	3.81	3.85	3.54	2.80	2.04
	S	2.21	2.76	2.89	2.58	2.08	2.18	1.99	1.48	1.03
	C	0.0	0.0	0.63	1.93	2.27	2.30	2.06	1.77	1.96
	Total	4.30	5.25	6.20	7.99	7.64	7.75	7.18	5.15	3.85

*mean number per center per child
†total = average of CSM + S + C
§— = center average not calculable because of missing data

PART II — TABLE 78

AVERAGE NUMBER OF KILOGRAMS* OF VARIOUS COMMODITIES DISTRIBUTED DURING JANUARY-OCTOBER, 1982 AND NUMBER OF CENTERS REPORTING, BY REGION, FOR 151 CENTERS

Region	Type of Food	Jan	Feb	March	April	May	June	July	August	Sept	Oct
Cap Vert	CSM	1.85	1.15	0.44	0.0	4.55	6.27	1.66	5.18	3.33	2.44
	S	1.01	0.70	0.0	0.0	1.40	1.35	0.25	1.48	2.28	0.32
	C	1.28	1.05	0.96	0.0	3.15	4.91	1.41	3.70	1.02	2.11
	Total†	4.15	2.91	1.40	0.0	9.10	12.53	3.32	10.36	6.64	4.88
Casamance	CSM	1.55	1.15	0.56	2.52	3.08	2.44	3.67	2.24	1.52	0.0
	S	1.11	0.91	0.28	0.65	1.18	1.18	0.64	0.32	0.46	0.0
	C	2.10	1.77	1.23	2.15	2.14	1.53	2.95	1.78	1.20	0.0
	Total	4.77	3.84	2.07	5.34	6.40	5.16	7.27	4.35	3.18	0.0
Diourbel	CSM	3.47	3.64	2.16	0.0	5.22	4.62	3.72	3.94	2.39	0.87
	S	0.0	0.0	0.0	0.0	5.16	3.55	0.32	0.38	0.46	0.09
	C	3.48	3.65	2.18	0.0	0.0	0.99	3.47	3.56	1.75	0.70
	Total	6.96	7.30	4.34	0.0	10.38	9.17	7.51	7.89	4.60	1.66
Fleuve	CSM	0.37	0.02	0.04	1.02	3.19	3.32	3.38	3.03	1.57	0.33
	S	0.21	0.01	0.0	0.04	0.00	0.36	0.0	0.0	0.07	0.0
	C	2.40	2.55	1.58	0.35	0.01	1.96	3.43	3.63	2.56	0.73
	Total	2.99	2.58	1.63	1.42	3.21	5.64	6.81	6.67	4.20	1.06
Louga	CSM	3.47	2.92	0.86	0.29	2.51	5.18	2.20	2.50	3.41	2.19
	S	0.0	0.98	0.0	0.0	2.40	5.27	0.67	0.71	2.83	1.90
	C	3.45	3.03	0.72	0.29	0.75	3.05	2.09	2.39	3.39	1.49
	Total	6.92	6.93	1.58	0.58	5.66	13.50	4.96	5.60	9.63	5.58
Senegal Oriental	CSM	3.21	2.76	1.73	1.39	0.0	2.70	3.08	3.13	2.74	1.79
	S	2.77	2.52	0.88	0.0	0.0	1.50	0.0	2.39	0.0	0.0
	C	3.31	2.27	1.51	1.27	0.0	2.99	3.06	2.97	2.72	1.80
	Total	9.29	7.55	4.12	2.66	0.0	7.19	6.14	8.49	5.46	3.59
Sine Saloum	CSM	3.31	2.80	2.56	0.76	1.20	1.67	3.60	3.60	3.13	0.96
	S	2.59	0.74	0.82	0.03	1.06	1.60	2.79	1.27	1.50	0.22
	C	3.59	3.09	2.83	1.14	0.0	0.0	3.58	3.58	3.07	0.71
	Total	9.49	6.63	6.21	1.93	2.26	3.27	9.97	8.45	7.70	1.89
All Regions	CSM	1.85	1.40	0.86	1.35	2.93	3.17	3.34	2.95	2.16	0.69
	S	0.83	0.57	0.18	0.26	1.11	1.39	0.44	0.36	0.59	0.17
	C	2.61	2.40	1.58	1.08	1.02	1.81	3.08	2.86	2.10	0.64
	Total	4.17	3.41	1.78	2.47	4.64	5.63	6.40	5.50	3.72	0.72

*mean number per center per child
†total = average of CSM + S + C
§— = center average not calculable because of missing data

PART II — TABLE 8A

AVERAGE PERCENTAGE OF CHILDREN IN EACH CENTER LESS THAN 70 PERCENT OF REFERENCE FOR WEIGHT FOR AGE FOR APRIL-DECEMBER 1981 BY REGION, TYPE, LOCATION AND FOOD AVAILABILITY RATING OF CENTERS*

	April	May	June	July	August	Sept	Oct	Nov	Dec
Region									
Cap Vert	9.02	4.53	4.80	6.17	6.13	6.92	7.32	7.44	7.35
Casamance	5.20	4.88	5.16	5.91	6.39	7.75	7.85	7.07	6.67
Diourbel	7.98	8.63	9.99	12.13	11.85	12.66	13.58	11.70	11.77
Fleuve	6.42	7.62	7.29	8.36	7.87	8.29	8.96	8.66	7.09
Louga	6.77	7.79	8.44	10.10	10.46	11.02	12.58	10.61	8.44
Senegal Oriental	8.30	9.40	9.40	7.81	8.90	8.25	9.79	9.00	6.92
Sine Saloum	7.46	6.31	6.58	8.03	8.18	10.54	11.42	10.61	7.81
Thies	5.71	6.11	6.96	8.53	8.51	9.58	9.87	7.92	6.66
Center Type									
Dispensaire	6.71	7.04	7.08	8.34	8.32	9.42	10.03	9.10	7.62
Maternite	5.13	5.53	7.63	7.49	7.31	6.93	6.57	6.84	6.42
Centre Social	4.03	4.36	5.48	6.36	7.80	7.60	8.31	8.04	6.83
Religieux	4.85	3.93	5.01	6.11	6.17	7.14	7.05	6.96	5.82
Maisons familiale	4.28	4.13	4.86	5.02	4.48	6.58	8.13	8.08	6.40
Location									
Urban	5.20	4.61	4.64	6.31	6.83	7.08	7.57	7.89	7.01
Semi-urban	5.00	5.95	7.00	7.74	7.91	8.26	8.90	8.38	7.08
Villages	6.64	6.98	7.15	8.41	8.37	9.56	10.16	9.05	7.56
Food Availability									
0	4.90	4.64	5.30	7.69	8.45	7.80	9.23	7.65	6.46
1-25	4.95	5.50	5.84	6.96	7.14	8.80	7.43	7.25	6.06
26-49	6.90	9.52	8.30	9.49	8.28	9.64	9.62	9.25	7.16
50-99	6.56	6.83	7.02	7.83	7.51	8.23	9.32	8.90	7.64
100+	6.70	6.29	7.01	8.31	8.60	9.49	10.42	9.29	7.91
Total	6.26	6.47	6.82	8.06	8.11	9.03	9.60	8.78	7.41
Number of Centers	198	242	259	307	310	316	295	296	277

*for all centers in Senegal with available data

PART II — TABLE 8B

AVERAGE PERCENTAGE OF CHILDREN IN EACH CENTER LESS THAN 70 PERCENT OF REFERENCE FOR WEIGHT FOR AGE FOR JANUARY-SEPTEMBER 1982 BY REGION, TYPE, LOCATION AND FOOD AVAILABILITY RATING OF CENTERS*

	Jan	Feb	March	April	May	June	July	August	Sept	Oct
Region										
Cap Vert	3.96	2.86	3.21	4.68	3.54	3.24	4.19	4.56	4.43	6.70
Casamance	5.81	5.33	5.25	5.28	4.97	5.60	5.87	7.60	—†	—
Diourbel	9.57	8.12	6.95	6.85	9.51	10.89	11.76	11.91	12.62	14.57
Fleuve	6.05	5.71	5.89	6.54	6.33	7.28	7.63	6.16	6.78	7.58
Louga	7.56	6.87	7.13	7.63	6.81	7.40	6.78	7.02	—	—
Senegal Oriental	6.58	6.26	5.93	6.21	7.91	8.48	8.57	7.70	—	—
Sine Saloum	7.05	6.56	5.91	6.19	5.56	5.58	5.79	6.79	7.08	8.35
Thies	5.80	4.70	4.05	3.97	5.20	4.34	5.73	5.91	7.46	8.71
Center Type										
Dispensaire	6.65	6.06	5.87	6.38	6.27	6.71	7.25	7.37	7.89	9.11
Maternite	6.51	4.13	4.06	4.71	4.32	5.82	6.34	4.86	5.03	6.57
Centre Social	4.24	4.60	4.30	3.41	3.45	3.94	4.78	6.12	5.12	5.20
Religieux	5.11	4.57	4.28	4.26	4.27	4.53	4.53	4.86	6.87	7.72
Maisons familiale	6.75	4.47	4.42	2.71	5.20	5.85	5.51	5.05	4.81	5.22
Location										
Urban	5.68	4.26	4.05	5.01	3.87	4.25	5.11	5.58	5.54	6.40
Semi-urban	6.24	5.63	5.25	4.83	5.30	5.60	6.08	6.89	7.05	8.17
Villages	6.52	6.00	5.82	6.21	6.37	6.86	7.33	7.15	7.97	9.17
Food Availability										
0	5.93	5.49	5.96	5.91	5.64	6.57	5.52	6.73	—	—
1-25	5.26	4.80	4.60	5.33	4.76	5.49	6.36	6.19	6.29	6.46
26-49	6.27	5.96	5.87	5.27	6.38	6.78	6.65	6.20	7.00	7.74
50-99	6.63	6.05	6.15	6.36	6.43	7.22	7.75	6.34	6.54	7.93
100+	6.72	5.82	5.35	5.82	5.94	6.09	6.83	7.64	8.44	10.26
Total	6.37	5.71	5.50	5.82	5.88	6.34	6.89	6.96	7.56	8.75
Number of Centers	278	277	267	260	279	303	296	231	178	106

*for all centers in Senegal with available data
†— = no available data

PART II — TABLE 9

AVERAGE ATTENDANCE AT CENTERS AND NUMBER OF CENTERS REPORTING BEFORE AND DURING THE PERIOD* OF RUPTURE

Months of Rupture	December 1981		January–May 1982*		
	No. Centers	Attendance	No. Centers	Average of Attendance	Relative Percentage Attendance Difference
0	45	329.6	49	339.1	+2.9
1	39	321.4	39	299.3	-6.9
2	23	368.3	23	325.2	-11.7
3	21	269.9	24	244.0	-9.6
4	9	310.3	10	243.1	-21.7
5	4	163.5	4	139.7	-14.6
Total	141	318.8	149	299.4	-6.1

*based on average attendance only during months of rupture

PART II — TABLE 10

AVERAGE CENTER ATTENDANCE BEFORE AND AFTER THE RUPTURE PERIOD BY DURATION OF RUPTURE

Months of Rupture	December 1981		June 1982		Relative Percentage Attendance Difference
	No. Centers	Attendance	No. Centers	Attendance	
0	45	329.6	46	357.5	+8.5
1	39	321.4	39	315.6	-1.8
2	23	368.3	23	344.3	-6.5
3	21	269.9	22	281.3	+4.2
4	9	310.3	10	261.7	-15.7
5	4	163.5	4	171.0	+4.6
Total	141	318.8	144	320.6	+0.6

PART II — TABLE 11

AVERAGE PERCENTAGE OF CHILDREN IN EACH CENTER LESS THAN 70 PERCENT OF REFERENCE FOR WEIGHT FOR AGE BEFORE, DURING AND AFTER THE RUPTURE PERIOD BY LENGTH OF RUPTURE

Months of Rupture	1981		1982
	June	December	June
0	7.3	7.6	7.5
1	6.3	7.0	5.9
2	5.7	7.3	5.5
3	6.1	6.3	6.2
4	7.0	6.3	5.9
5	8.0	4.1	6.0
Total	6.6	7.0	6.4

PART III, TABLE 1

CHARACTERISTICS OF CENTERS SAMPLED IN PART III

Center	Growth Data Usable	Sex of Children Known	Start Date	Number of Children
CAP VERT				
1104 Dispensaire de Camberene	Yes	No	6/81	219
1302 PMI Rufisque*	No	-	-	-
1203 Croix Rouge Pikine*	No	-	-	-
CASAMANCE				
2112 Dispensaire Munic. Bignona	Yes	Yes	3/80	346
2102 Dispensaire de Affinian-Elana	Yes	Yes	10/80	334
2204 Dispensaire de Sare Yoba	Yes	Yes	5/80	225
2302 Dispensaire de Elinkine	Yes	Yes	1/80	300
2413 Centre Social Faoune	Yes	Yes	9/80	656
2407 Dispensaire n'Diamacouta	Yes	Yes	1/81	508
2610 Centre Social Ziguinchor	Yes	Yes	1/80	379
2602 Dispensaire de Bissine	Yes	Yes	4/80	497
DIOURBEL				
3103 Dispensaire de Keur Samba Kane	No	-	-	-
3203 Dispensaire de N'Dindy	Yes	Yes	1/80	437
3304 Dispensaire de Touba Belela	Yes	Yes	12/80	476
FLEUVE				
4108 Sous-Centre NGaye-Ngaye	No	-	-	-
4110 PMI de Sor	No	-	-	-
4201 Dispensaire de Gae	Yes	Yes	1/81	582
4206 Dispensaire de Thiare	No	-	-	-
4303 Dispensaire de Demette	No	-	-	-
4316 Dispensaire de Thille Boubacar	No	-	-	-
4305 Dispensaire de Diomandou	Yes	Yes	5/81	318
4411 Dispensaire de Bondou	No	-	-	-
4413 Dispensaire de Waounde	No	-	-	-
4409 Dispensaire de Boynadsi	No	-	-	-
LOUGA				
5203 Dispensaire de Velingara	No	-	-	-
5305 Dispensaire de Sakal	No	-	-	-

*Substitute for center with no register

PART III, TABLE 1 (continued)

CHARACTERISTICS OF CENTERS SAMPLED IN PART III

Center	Growth Data Usable	Sex of Children Known	Start Date	Number of Children
SENEGAL-ORIENTAL				
6201 Dispensaire de Pongolemby	No	-	-	-
6301 Dispensaire de Maka	No	-	-	-
6302 Dispensaire de Bamba	No	-	-	-
6101 Dispensaire de Bele*	Yes	Yes	7/81	110
6102 Dispensaire de Conthiary*	No	-	-	-
SINE SALOUM				
7101 Dispensaire de Diarakhe	No	-	-	-
7201 Dispensaire de Touba Couta	No	-	-	-
7301 Dispensaire de MBar	Yes	Yes	1/80	403
7401 Dispensaire de Gniby	Yes	Yes	5/81	305
7402 Dispen. des Souers de Koungheul	Yes	Yes	1/80	493
7602 Dispensaire de Wack NGouna	No	-	-	-
7601 Dispensaire de Paos Koto	Yes	No	2/80	375
THIES				
8102 Dispensaire de Ndiayene Sirakh	No	-	-	-
8101 Dispen. Social Rte de St. Louis	Yes	No	1/81	508
8103 CER de NGoundiane	No	-	-	-
8201 Dispensaire de Pambal	Yes	No	1/80	490
8301 CER Thiadioye	No	-	-	-
8302 MBour*	No	-	-	-
TOTAL				7961

*Substitute for center with no register

147

PART III — TABLE 2

DESCRIPTION OF NEW ENTRANTS AND CHILDREN IN TOTAL SAMPLE

TOTAL SAMPLE

	Number of Centers	Number of Children
Centers not recording sex	4	1592
Centers recording sex	16	6369
Total	20	7961

NEW ENTRANTS IN ALL CENTERS

	Number of Children
Total	4245
Unknown age	327
Unknown sex	903
Unknown age or sex	1155
Known age and sex	3090

PART III — TABLE 3

FREQUENCY AND PERCENTAGE AGE DISTRIBUTIONS BY SEX
FOR ALL NEW PROGRAM ENTRANTS, 1980-1982*

Age in Years	Centers with children of known sex				Centers not recording sex of children			
	Male		Female		Male		Female	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
<2	1411	90.5	1250	88.2	606	95.6	3367	90.4
2-3	117	7.5	123	8.0	19	3.0	259	7.9
3-4	26	1.7	52	3.4	8	1.3	86	2.3
4-5	5	.3	6	0.4	1	0.2	12	0.3
Total	1559	100.0	1531	100.0	634	100.0	3724	100.0

*data available by center

PART III — TABLE 4

DISTRIBUTIONS OF PERCENTAGE OF REFERENCE FOR WEIGHT FOR AGE BY SEX FOR ALL NEW PROGRAM ENTRANTS*

Percentage of Reference	Male		Female	
	Frequency	%	Frequency	%
<50	16	1.0	8	.5
50-59	43	2.6	24	1.5
60-69	95	5.8	101	6.4
70-79	213	13.1	196	12.5
80-89	365	22.4	300	19.1
90-100+	896	55.0	940	59.9
Total	1628	100.0	1569	100.0

*data also available by center

PART III — TABLE 5

NUMBER OF NEW PROGRAM ENTRANTS AND PERCENTAGE DISTRIBUTIONS FOR AGE AT ENTRY BY MONTH AND YEAR OF ENTRY FOR CENTERS WITH CHILDREN OF KNOWN SEX

Year	Month	<6 mos	6-11 mos	12-17 mos	18-23 mos	2-3 ans	3-4 ans	4-5 ans	Number of New Entrants
1980	Jan	22.2	22.2	55.6	0.0	0.0	0.0	0.0	9
	Feb	71.4	19.0	9.5	0.0	0.0	0.0	0.0	21
	Mar	58.3	16.7	8.3	8.3	0.0	8.3	0.0	12
	Apr	60.0	0.0	20.0	0.0	20.0	0.0	0.0	5
	May	66.0	13.1	9.4	3.8	5.7	0.0	0.0	53
	Jun	59.5	16.2	9.5	6.8	8.1	0.0	0.0	74
	Jul	48.6	21.6	10.8	13.5	5.4	0.0	0.0	37
	Aug	69.4	25.0	0.0	2.8	2.8	0.0	0.0	36
	Sep	54.2	18.8	22.9	2.1	0.0	0.0	2.1	48
	Oct	16.7	11.9	19.0	8.7	36.5	6.3	0.8	126
	Nov	41.4	21.4	12.9	8.6	11.4	2.9	1.4	70
	Dec	36.4	36.4	9.1	0.0	0.0	18.2	0.0	11
	Total	45.6	17.5	13.9	6.4	13.3	2.6	0.6	502
1981	Jan	50.4	18.8	13.5	3.8	9.8	3.0	0.8	133
	Feb	45.6	20.1	16.8	8.1	4.7	4.7	0.0	149
	Mar	56.5	23.2	8.5	6.8	4.5	0.6	0.0	177
	Apr	54.3	22.9	11.4	5.7	2.9	2.9	0.0	35
	May	46.6	31.9	14.7	3.4	2.6	0.0	0.9	116
	Jun	41.9	26.7	15.1	5.8	7.0	3.5	0.0	86
	Jul	44.7	21.7	14.9	6.2	10.6	1.2	0.6	161
	Aug	38.4	33.1	11.9	8.6	5.3	2.6	0.0	151
	Sep	57.4	26.9	4.6	2.8	6.5	1.9	0.0	108
	Oct	48.8	27.1	10.1	7.0	3.1	3.1	0.8	129
	Nov	61.7	27.8	5.6	1.2	2.5	0.6	0.6	162
	Dec	65.6	19.8	9.3	1.0	4.2	2.1	0.0	96
	Total	50.7	23.1	11.2	5.2	5.5	2.1	0.3	1503
1982	Jan	57.6	7.6	6.8	9.8	10.6	7.6	0.0	132
	Feb	42.7	22.2	23.1	0.9	10.3	0.9	0.0	117
	Mar	72.9	13.6	5.1	5.1	1.7	1.7	0.0	59
	Apr	63.5	12.9	3.5	4.7	15.3	0.0	0.0	85
	May	55.6	19.0	12.7	6.3	1.6	4.8	0.0	63
	Jun	49.5	25.7	12.8	6.4	3.7	0.0	1.8	109
	Jul	26.4	44.5	12.7	6.4	10.0	0.0	0.0	110
	Aug	45.0	26.9	8.1	6.9	10.6	1.9	0.6	160
	Sep	43.6	22.5	15.7	4.4	6.9	5.9	1.0	204
	Oct	50.3	19.6	14.7	8.4	4.9	2.1	0.0	143
	Nov	70.5	12.5	6.8	4.5	4.5	1.1	0.0	88
	Dec	64.3	11.9	7.1	4.8	9.5	2.4	0.0	42
	Total	50.5	21.1	11.7	5.9	7.8	2.7	0.4	1312

PART III — TABLE 6

NUMBER OF NEW PROGRAM ENTRANTS AND PERCENTAGE DISTRIBUTIONS OF WEIGHT FOR AGE PERCENT OF REFERENCE FOR CENTERS WITH CHILDREN OF KNOWN SEX

		WAPM						
Year	Month	<50	50-59	60-69	70-79	80-89	90-100	Number of New Entrants
1980	Jan	0.0	0.0	0.0	0.0	10.0	90.0	10
	Feb	0.0	0.0	0.0	11.1	33.3	55.6	18
	Mar	0.0	0.0	0.0	0.0	7.1	92.9	14
	Apr	0.0	0.0	0.0	16.7	16.7	66.7	6
	May	2.0	0.0	2.0	12.0	6.0	78.0	50
	Jun	0.0	0.0	11.1	12.5	8.3	68.1	72
	Jul	0.0	0.0	0.0	5.1	30.8	64.1	39
	Aug	2.9	0.0	2.9	17.1	14.3	62.9	35
	Sep	2.2	4.3	4.3	10.9	30.4	47.8	46
	Oct	0.0	1.7	6.0	10.3	21.6	60.3	116
	Nov	0.0	0.0	5.1	25.4	32.2	37.3	59
	Dec	0.0	0.0	11.1	0.0	33.3	55.6	9
	Total	0.6	0.8	4.9	12.2	20.3	61.2	474
1981	Jan	0.0	2.3	3.1	16.0	23.7	55.0	131
	Feb	0.7	0.0	5.9	16.4	19.7	57.2	152
	Mar	1.2	1.2	5.3	9.9	16.4	66.1	171
	Apr	0.0	0.0	2.9	11.8	14.7	70.6	34
	May	0.0	1.7	5.2	7.8	19.0	66.4	116
	Jun	0.0	1.2	2.4	16.7	10.9	69.0	84
	Jul	0.6	1.8	9.0	12.7	24.1	51.8	166
	Aug	1.9	4.5	7.1	16.9	22.1	47.4	154
	Sep	2.0	2.0	8.0	9.0	20.0	59.0	100
	Oct	1.5	3.0	6.1	14.4	23.5	51.5	132
	Nov	0.7	4.7	4.0	6.0	28.2	56.4	149
	Dec	0.0	3.2	5.3	14.9	19.1	57.4	94
	Total	0.8	2.3	5.7	12.7	20.9	57.7	1483
1982	Jan	0.0	3.7	4.4	13.3	24.4	54.1	135
	Feb	2.8	1.9	16.7	12.0	25.0	41.7	108
	Mar	3.2	0.0	3.2	12.9	21.0	59.7	62
	Apr	0.0	1.2	3.7	9.8	17.1	68.3	82
	May	0.0	3.4	3.4	15.5	17.2	60.3	58
	Jun	1.0	0.0	5.7	14.3	22.9	56.2	105
	Jul	0.0	1.8	10.9	17.3	21.8	48.2	110
	Aug	0.6	0.6	4.9	11.1	22.8	59.9	162
	Sep	1.1	4.2	7.9	15.8	18.4	52.6	190
	Oct	0.0	5.1	8.2	15.3	16.3	55.1	98
	Nov	0.0	2.3	6.9	6.9	18.4	65.5	87
	Dec	0.0	2.3	7.0	9.3	23.3	58.1	43
	Total	0.7	2.3	7.2	13.1	20.9	55.7	1240

PART III — TABLE 7

PERCENTAGE DISTRIBUTIONS OF NUTRITIONAL STATUS AT ENTRY* BY AGE FOR ALL CHILDREN ENTERING THE PROGRAM 1980-1982

Percent of Reference	Age at Entry in Months							
	<6	6-11	12-17	18-23	24-35	36-47	48-59	Total
<50	0.3	1.1	1.6	1.8	0.4	0.0	9.1	0.8
50-59	0.7	2.7	4.9	3.0	4.6	3.8	0.0	2.2
60-69	3.1	7.2	13.2	12.0	9.2	7.7	9.1	6.3
70-79	6.2	16.5	27.5	28.1	15.8	9.0	27.3	13.1
80-89	15.5	26.7	25.5	23.4	30.0	29.5	27.3	21.2
90+	74.2	45.7	27.2	31.7	40.0	50.0	27.3	56.5
Number of New Entrants	1513	696	363	166	239	78	10	3065

*Percent of reference of weight for age for all children from centers with children of known sex.

PART III — TABLE 8

PERCENTAGE DISTRIBUTIONS FOR AGE AND WEIGHT FOR AGE PERCENTAGE OF REFERENCE FOR ALL NEW PROGRAM ENTRANTS BY CENTER FOR 1980-1982

		Age in Years					Percent of Reference					
Center	N*	<2	2-3	3-4	4-5	5+	<50	50-59	60-69	70-79	80-89	90-100
Camberene**	11	100.0	0.0	0.0	0.0	0.0	-	-	-	-	-	-
Bignona	193	100.0	0.0	0.0	0.0	0.0	0.0	1.5	3.6	11.9	23.7	59.3
Affinian	127	95.1	3.3	1.6	0.0	0.0	0.0	2.4	4.7	6.3	15.0	71.7
Sare Yoba	200	93.2	5.8	1.0	0.0	0.0	0.5	2.0	6.5	11.5	17.5	62.0
Elinkine	28	100.0	0.0	0.0	0.0	0.0	3.6	0.0	0.0	0.0	17.9	78.6
Diomandou	82	87.8	9.6	2.7	0.0	0.0	1.9	2.3	8.7	13.5	20.0	53.5
Faoune	220	87.8	8.9	2.8	0.5	0.0	2.3	5.9	8.6	6.8	23.6	52.7
Bissine	342	90.3	5.9	3.2	0.6	0.0	0.6	1.2	4.7	11.7	19.9	62.0
Ziguinchor	255	98.8	1.2	0.0	0.0	0.0	0.4	1.2	4.7	11.8	17.6	64.3
N'Dindy	235	99.1	0.4	0.0	0.4	0.0	0.9	0.4	7.2	14.9	21.3	53.8
Touba Belale	329	67.6	18.7	11.9	1.8	0.0	0.6	2.7	6.7	14.9	21.3	53.8
Gae	167	85.5	11.5	3.0	0.0	0.0	0.6	3.0	10.2	10.8	20.4	55.1
Diamacoutou	310	92.8	7.2	0.0	0.0	0.0	1.9	1.9	7.7	14.2	19.4	53.8
Bele	37	93.3	6.7	0.0	0.0	0.0	0.0	0.0	2.7	8.1	13.5	75.7
Mbar	252	94.8	5.2	0.0	0.0	0.0	0.0	2.0	5.2	19.0	25.8	48.0
Gniby	-	-	-	-	-	-	-	-	-	-	-	-
Koungheul	419	82.3	14.8	2.8	0.3	0.0	0.7	1.2	5.5	13.1	20.3	59.2
Paos Koto**	227	92.3	4.7	2.6	0.4	0.0	-	-	-	-	-	-
St. Louis**	164	97.0	2.4	0.6	0.0	0.0	-	-	-	-	-	-
Pambal**	196	97.7	1.8	0.5	0.0	0.0	-	-	-	-	-	-

* Number of children used in weight for age percent of reference percentages
** No new entrants of known sex and age during 1980-1982

PART III — TABLE 9

PERCENTAGE OF NEW ENTRANTS RELATIVE TO TOTAL NUMBER OF CHILDREN WEIGHED BY MONTH AND YEAR BASED ON CENTERS WITH SEX OF CHILDREN RECORDED

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1980	2.3	3.8	2.5	1.0	8.1	8.5	7.3	6.6	7.1	13.2	6.5	1.0
1981	7.7	7.6	8.6	1.8	4.6	4.2	5.9	5.6	3.5	4.4	5.7	3.2
1982	4.7	4.2	2.5	3.7	2.5	4.2	4.0	5.7	6.8	5.4	3.6	2.0

PART III — TABLE 10

FREQUENCY DISTRIBUTIONS OF REASON FOR CHILDREN LEAVING THE PROGRAM BY CENTER FOR 1980-1982

Center	Deceased	Excluded	Transfer	Parted	Not Reported	Total
Camberene*	0	0	0	2	0	2
Bignona	0	0	0	0	100	100
Affinian	5	2	0	0	71	78
Sare Yoba	5	4	0	2	40	51
Elinkine	4	5	0	2	151	162
Faoune	14	131	0	8	188	341
Bissine	7	4	0	5	107	123
N'Dindy	21	9	0	30	97	157
Touba Belele	9	5	0	34	31	79
Gae	24	134	7	43	15	223
Diamandou	10	6	0	58	14	88
Bele	0	0	0	0	7	7
Mbar	3	71	2	0	95	171
Gniby	6	12	1	31	45	95
Koungheul	18	29	0	57	40	144
Paos Koto*	4	5	0	0	96	105
St. Louis*	2	13	0	35	67	117
Pambal*	17	0	1	21	32	71
Diamacouta	21	40	0	0	25	86
Ziguinchor	7	2	0	1	107	117
Mbour	0	0	0	0	0	0
Total	177	462	11	327	1330	2317

*Sex of children unknown

PART III — TABLE 11

PERCENTAGE DISTRIBUTION OF AGE BY REASON FOR CHILDREN LEAVING THE PROGRAM DURING 1980-1982 AT GAE

	Reason for Leaving					
Age in Months	Deceased	Excluded	Transfer	Parted	No Data	Total
<6	8.3	0.7	14.3	2.3	0.0	2.2
6-11	12.5	12.7	0.0	4.7	6.7	10.3
12-17	29.2	17.9	14.3	2.3	20.0	16.1
18-23	8.3	11.2	0.0	4.7	13.3	9.4
24-35	20.8	29.1	28.6	14.0	26.7	25.1
36-47	12.5	21.6	14.3	9.3	6.7	17.0
48-59	8.3	6.0	28.6	46.5	26.7	16.1
60+	0.0	0.7	0.0	16.3	0.0	3.6
Number of Children Leaving	24	134	7	43	15	223

PART III — TABLE 12

PERCENTAGE DISTRIBUTION FOR WEIGHT FOR AGE PERCENT OF REFERENCES BY REASON FOR CHILDREN LEAVING THE PROGRAM AT GAE

Reason for Leaving

Percent of Reference	Deceased	Excluded	Transfer	Parted	No Data	Total
<50	0.0	0.0	0.0	0.0	0.0	0.0
50–59	14.3	1.5	0.0	0.0	0.0	2.3
60–69	9.5	6.9	16.7	4.8	14.3	7.5
70–79	38.1	25.2	0.0	16.7	21.4	23.8
80–89	14.3	27.5	33.3	38.1	35.7	29.0
90+	23.8	38.9	50.0	40.5	28.6	37.4
Number of Children Leaving	21	131	6	42	14	214

PART III — TABLE 13

PERCENTAGE DISTRIBUTION FOR NUTRITIONAL STATUS BY AGE* FOR ALL CHILDREN LEAVING THE PROGRAM 1980-1982

Age in Months

Percent of Reference	<6	6-11	12-17	18-23	24-35	36-47	48-59	60+	Total
<50	0.0	1.4	1.3	1.2	0.7	0.5	0.0	0.0	0.7
50-59	1.2	3.0	4.7	2.9	3.0	1.0	0.7	2.7	2.7
60-69	2.4	6.3	12.0	12.8	9.3	4.3	3.0	0.0	7.4
70-79	4.9	17.2	27.8	27.3	17.1	17.3	15.5	25.7	19.4
80-89	19.5	26.7	27.4	27.3	33.1	29.8	41.4	33.8	31.2
90+	72.0	43.4	26.9	28.5	36.8	47.1	39.5	37.8	38.5
Number of Children Leaving	82	221	234	242	432	208	304	74	1797

*Percent of reference of weight for age for all children from center recording sex of children

PART III — TABLE 14

PERCENTAGES OF CHILDREN LEAVING THE PROGRAM RELATIVE TO TOTAL NUMBER OF CHILDREN WEIGHED BY MONTH AND YEAR FOR ALL CENTERS

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1980	2.1	1.5	2.2	1.3	1.4	3.6	1.1	1.8	3.0	1.6	1.0	4.9
1981	1.4	2.3	1.8	2.2	2.3	1.4	1.6	1.6	2.2	2.2	2.5	5.6
1982	4.2	3.6	3.1	1.9	2.1	0.7	1.1	1.8	—	—	—	—

PART III — TABLE 15

NUMBER OF CHILDREN IN THE PROGRAM AND PERCENTAGE AGE DISTRIBUTIONS BY MONTH AND YEAR FOR CENTERS WITH CHILDREN OF KNOWN SEX

Year	Month	<2 ans	2-3 ans	3-4 ans	4-5 ans	>5 ans	No. of Children
1980	Jan	67.0	19.1	10.3	3.4	0.2	613
	Feb	67.6	19.3	8.5	4.2	0.5	601
	Mar	71.5	15.9	8.0	4.2	0.4	754
	Apr	72.2	16.9	6.5	4.1	0.2	826
	May	71.1	18.6	6.4	3.2	0.7	871
	Jun	69.8	18.8	7.0	3.6	0.7	939
	Jul	69.3	17.9	8.9	3.5	0.4	820
	Aug	68.6	18.3	9.3	3.1	0.7	872
	Sep	68.0	18.6	8.7	4.2	0.5	875
	Oct	64.5	24.6	7.9	2.5	0.5	1063
	Nov	63.3	24.2	9.3	3.0	0.3	1187
	Dec	55.9	29.1	11.8	3.0	0.2	1283
	Total	66.7	20.8	8.7	3.4	0.4	
1981	Jan	57.8	27.2	11.5	3.3	0.1	1862
	Feb	57.4	26.0	12.7	3.6	0.2	2197
	Mar	58.8	24.6	12.1	4.3	0.2	2284
	Apr	56.7	25.7	12.5	4.7	0.5	2353
	May	58.4	23.5	12.9	4.9	0.3	2716
	Jun	55.2	24.5	13.0	5.0	0.3	2509
	Jul	54.7	24.0	13.4	5.8	0.1	3229
	Aug	53.4	23.9	13.9	6.4	0.3	3094
	Sep	53.2	24.2	13.8	6.5	0.3	3401
	Oct	52.0	23.6	17.0	7.2	0.2	3339
	Nov	52.0	23.7	17.1	7.0	0.2	3128
	Dec	51.4	22.8	17.9	7.8	0.2	3242
	Total	54.7	24.3	13.0	5.8	0.2	
1982	Jan	50.1	22.7	19.1	7.8	0.3	3212
	Feb	48.1	23.2	19.2	9.1	0.4	3159
	Mar	49.1	22.7	18.9	9.0	0.4	2809
	Apr	49.1	23.1	18.2	9.0	0.6	2714
	May	45.9	24.1	19.2	10.3	0.4	3119
	Jun	46.8	23.0	18.4	11.2	0.6	2976
	Jul	44.9	23.5	19.2	11.8	0.6	3275
	Aug	44.2	24.6	18.9	11.9	0.4	3242
	Sep	44.7	24.0	18.9	12.0	0.4	3414
	Oct	45.5	23.5	17.9	12.8	0.3	2973
	Nov	44.3	23.8	18.0	13.6	0.4	2765
	Dec	40.6	25.5	18.1	15.2	0.5	2505
	Total	46.2	23.6	18.7	11.1	0.4	

PART III — TABLE 16

SAMPLE SIZE (N) AND PERCENTAGE OF CHILDREN LESS THAN 70 PERCENT OF REFERENCE FOR WEIGHT FOR AGE BY AGE AND SEASON OF YEAR*

Age Groups in Months	Season					
	November-February		March-June		July-October	
	N	%	N	%	N	%
1-9	3831	6.2	4347	3.4	4479	5.9
10-15	3889	11.5	3754	10.1	4249	14.4
16-20	3482	11.5	3635	8.3	4364	13.1
21-26	3485	9.7	3127	8.0	3625	9.7
27-32	2744	6.9	2577	6.7	3360	7.3
33-38	2495	6.5	2096	5.9	2500	5.8
39-44	1826	4.2	1707	5.8	2388	5.5
45-50	1425	5.3	1265	4.1	1560	4.2
51-56	937	4.4	731	2.5	1237	5.0
57-62	275	5.8	204	10.3	228	4.4
63-72	18	66.7	29	37.9	37	37.8
Total	24407	8.2	23472	6.7	30027	8.8

*Based on all weighings of all children enrolled in centers recording sex, 1980-1982

PART III — TABLE 17

SAMPLE SIZE (N) AND PERCENTAGE OF CHILDREN LESS THAN 70 PERCENT OF REFERENCE FOR WEIGHT FOR AGE BY AGE AND TIME IN PROGRAM

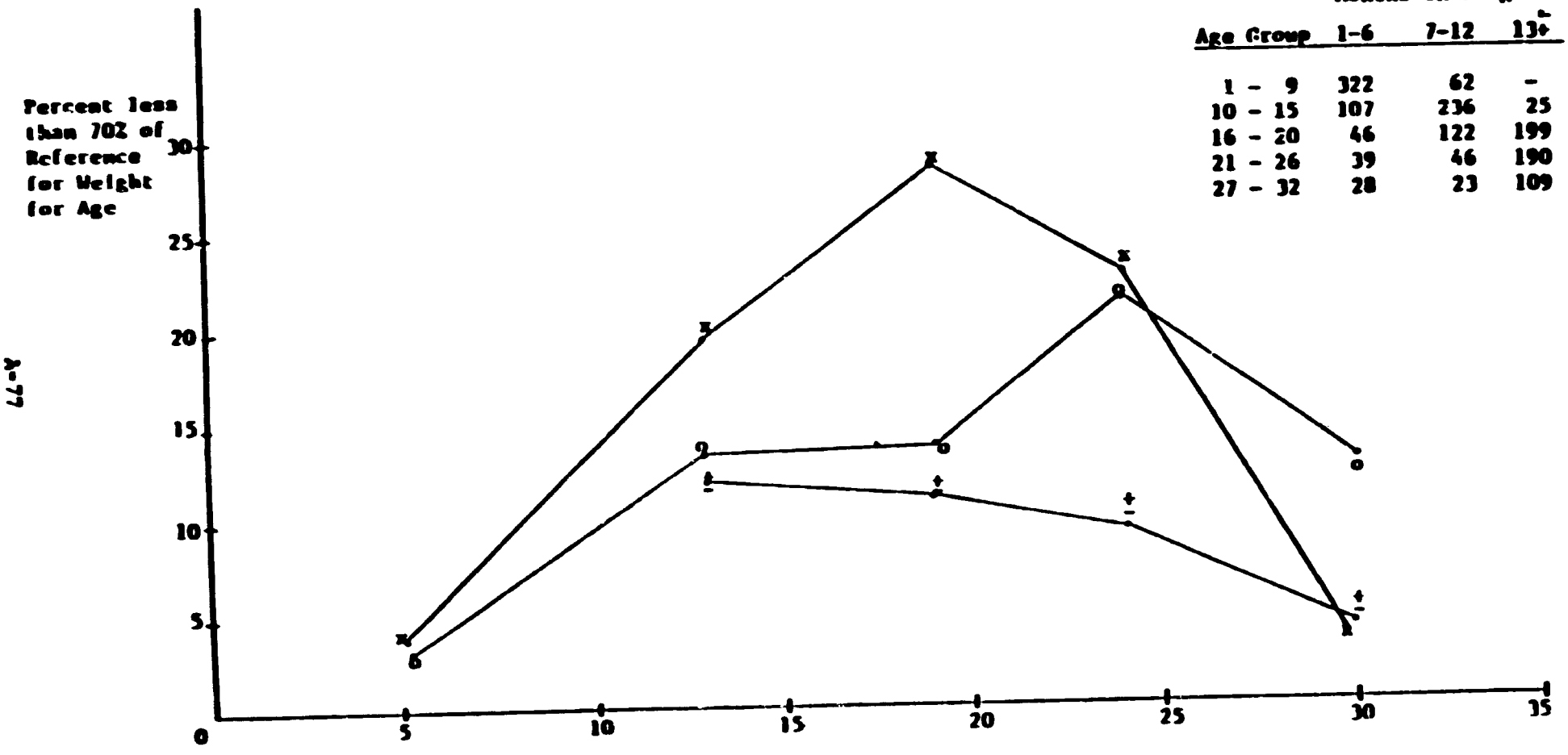
Months in Program*

Age Groups in Months	1-6		7-12		13+	
	N	%	N	%	N	$\bar{x}$
1-9	322	4.3	62	3.2	0	0.0
10-15	107	18.7	236	13.6	25	12.0
16-20	46	28.3	122	13.9	199	11.1
21-26	39	23.1	46	21.7	190	8.9
27-32	28	3.6	23	13.0	109	4.6
33-38	8	0.0	10	10.0	52	1.9
39-44	8	12.5	10	0.0	45	8.9
45-50	3	0.0	4	0.0	25	0.0
51-56	1	100.0	2	0.0	20	0.0
57-62	0	0.0	0	0.0	3	0.0
63-72	0	0.0	0	0.0	1	0.0
Total	562	10.5	515	12.6	669	7.8

*Based only on new program entrants from February 1980 to June 1982 as data available by center and year of July 1982

Part III, Figure 8.

Percentage of Children Less Than
70 Percent of Reference for Weight for Age and Time in Program*



Age Group	Months in Program 1-6	7-12	13+
1 - 9	322	62	-
10 - 15	107	236	25
16 - 20	46	122	199
21 - 26	39	46	190
27 - 32	28	23	109

*Source: Part III, Table 17

PART III — TABLE 18

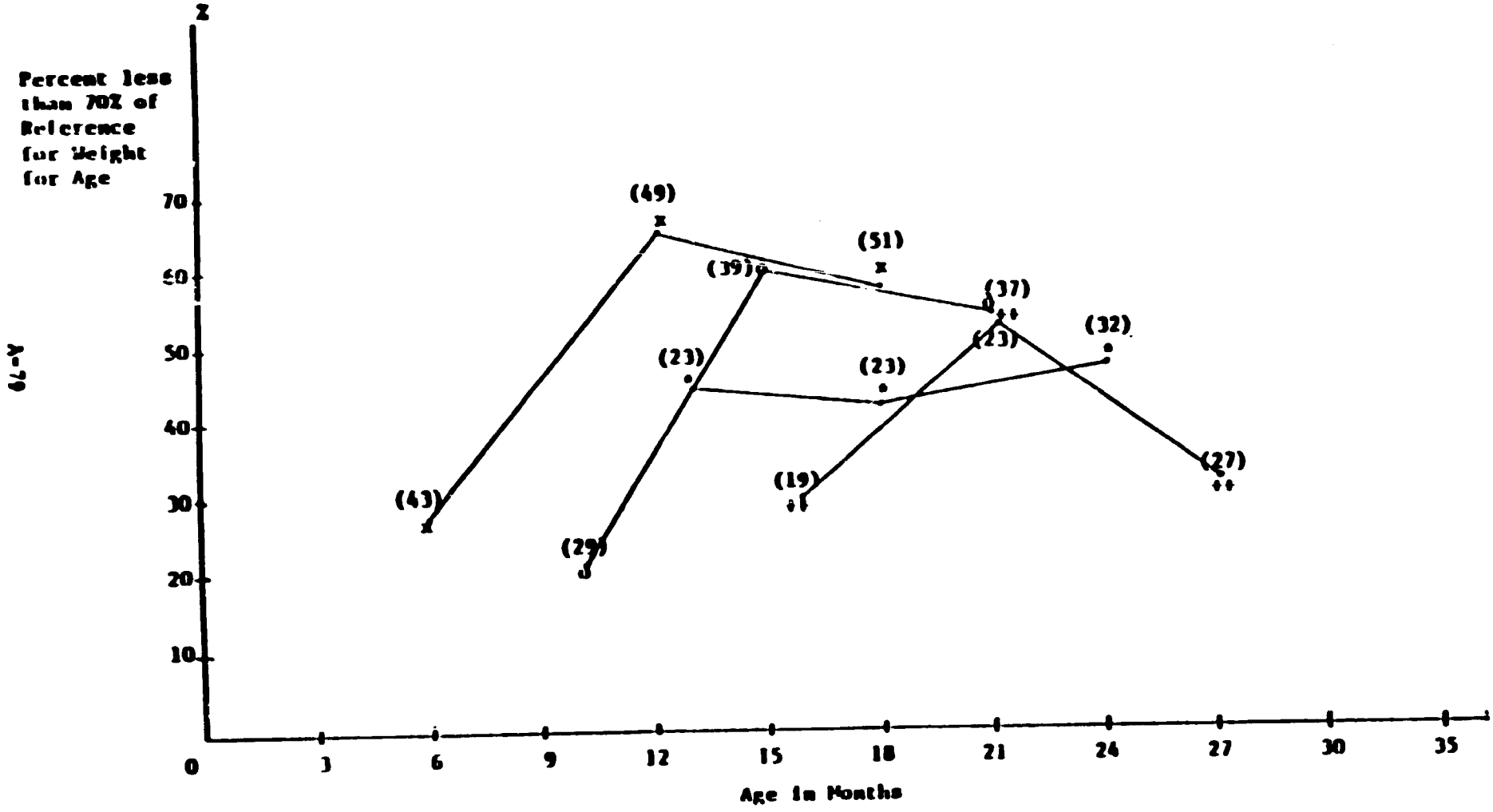
PERCENTAGE DISTRIBUTION FOR WEIGHT OF AGE PERCENT OF REFERENCE AND NUMBER OF CHILDREN* FOR CHILDREN ENTERING THE PROGRAM BELOW 70 PERCENT OF REFERENCE BY MONTHS IN PROGRAM AND AGE AT ENTRY INTO PROGRAM

Age of Cohort at Entry (months)	Months in Program	Age Range at Follow-up (months)	Number of Children	Percent of Reference <70	70-79	80+	Total
<6	3	4-9	43	27.9	51.2	20.9	100.0
	6	7-12	29	20.7	44.8	34.5	100.0
	9	10-15	22	45.5	36.4	18.2	100.0
	12	13-18	19	31.6	26.3	42.1	100.0
	18	19-24	9	11.1	44.4	44.4	100.0
	24	25-30	2	50.0	0.0	50.0	100.0
6-11	3	9-14	49	65.3	22.4	12.2	100.0
	6	12-17	39	61.5	20.5	17.9	100.0
	9	15-20	23	43.5	30.4	26.1	100.0
	12	18-23	23	56.5	30.4	13.0	100.0
	18	24-29	5	20.0	40.0	40.0	100.0
	24	30-35	1	0.0	0.0	100.0	100.0
12-17	3	15-20	51	58.8	35.3	5.9	100.0
	6	18-23	37	56.8	32.4	10.8	100.0
	9	21-26	32	53.1	37.5	9.4	100.0
	12	24-29	27	33.3	4079	25.9	100.0
	18	30-35	11	27.3	36.4	36.4	100.0
	24	36-41	6	16.7	33.3	50.0	100.0
18+	3	21+	39	64.1	28.2	7.7	100.0
	6	24+	26	52.8	27.8	19.4	100.0
	9	27+	22	54.5	27.3	18.2	100.0
	12	30+	19	47.4	21.1	31.6	100.0
	18	36+	12	25.0	33.3	41.7	100.0
	24	42+	7	14.3	57.1	28.6	100.0

*Based on all children entering the program 1980-1982 in centers recording sex of participants. Numbers of children in each cohort decrease primarily because of the time of data collection, e.g., children entering the program in 1982 could contribute data for at most the months in program of 3, 6, 9 and 12.

Part III, Figure 9.

Percentage of Children Less Than 70 Percent of Reference for Weight for Age and Sample Sizes (in parentheses) for 4 Lengths of Time in Program



Source: Part III, Table 18

x = 3 mos. in program
o = 6 mos. in program
• = 9 mos. in program
•• = 12 mos. in program

PART III — TABLE 19A

FREQUENCY AND PERCENTAGE DISTRIBUTION OF WEIGHT FOR AGE PERCENT OF REFERENCE AT FOLLOW-UP AGES 9, 12, 18 AND 24 MONTHS FOR ALL CHILDREN ENTERING THE PROGRAM AT AGES ≤6 MONTHS AND ABOVE 80 PERCENT OF REFERENCE FOR WEIGHT FOR AGE*

Follow-up Age in Months (mos. in program)	Percent of Reference at Follow-up							
	<70		70–79		80+		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
9 (3–8)	50	5.6	196	21.9	650	72.5	896	100.0
12 (6–11)	71	9.6	225	30.5	443	59.9	740	100.0
18 (12–17)	42	9.3	136	30.2	272	60.4	450	100.0
24 (18–23)	12	6.3	45	23.4	135	70.3	192	100.0

*These data are provided in more detail in Table 19B, i.e., stratified by nutritional status cohort at entry and for additional follow-up ages.

PART III — TABLE 19B

FREQUENCY AND PERCENTAGE DISTRIBUTION OF WEIGHT FOR AGE PERCENT OF REFERENCE AT AGES 9-24 MONTHS FOR ALL CHILDREN ENTERING THE PROGRAM AT AGES ≤6 MONTHS* BY WEIGHT FOR AGE PERCENT OF REFERENCE AT ENTRY

Follow-up Age in Months (mos. in program)	Percent of Reference at Entry	Percent of Reference at Follow-up: <70 Freq.	<70 %	70-79 Freq.	70-79 %	80-89 Freq.	80-89 %	90+ Freq.	90+ %	Total Freq.	Total %
9 (3-8)	<70	10	28.6	13	37.1	10	28.6	2	5.7	35	100.0
	70-79	22	31.4	27	38.6	14	20.0	7	10.0	70	100.0
	80-89	18	11.0	68	41.5	57	34.8	21	12.8	164	100.0
	90+	32	4.4	128	17.5	264	36.1	308	42.1	732	100.0
	Total	82	8.2	236	23.6	345	34.5	338	33.8	1001	100.0
12 (6-11)	<70	15	46.9	9	28.1	7	21.9	1	3.1	32	100.0
	70-79	22	40.7	22	40.7	7	13.0	3	5.6	54	100.0
	80-89	31	21.5	64	44.4	41	28.5	8	5.6	144	100.0
	90+	40	6.7	162	27.2	221	37.1	172	28.9	595	100.0
	Total	108	13.1	257	31.2	276	33.5	184	22.3	825	100.0
15 (9-14)	<70	7	30.4	4	17.4	12	52.2	0	0.0	23	100.0
	70-79	13	33.3	18	46.2	7	17.9	1	2.6	39	100.0
	80-89	30	26.3	51	44.7	27	23.7	6	5.3	114	100.0
	90+	39	8.0	137	28.1	179	36.8	132	27.1	487	100.0
	Total	89	13.4	210	31.7	225	33.9	139	21.0	663	100.0
18 (12-17)	<70	6	31.6	6	31.6	7	36.8	0	0.0	19	100.0
	70-79	9	26.5	21	61.8	3	8.8	1	2.9	34	100.0
	80-89	14	15.7	48	53.9	18	20.2	9	10.1	89	100.0
	90+	28	7.8	88	24.4	137	38.0	108	29.9	361	100.0
	Total	57	11.3	163	32.4	165	32.8	118	23.5	503	100.0
21 (15-20)	<70	2	18.2	2	18.2	6	54.5	1	9.1	11	100.0
	70-79	8	40.0	8	40.0	3	15.0	1	5.0	20	100.0
	80-89	13	18.8	34	49.3	15	21.7	7	10.1	69	100.0
	90+	20	7.0	63	22.0	114	39.9	89	31.1	286	100.0
	Total	43	11.1	107	27.7	138	35.8	98	25.4	386	100.0
24 (18-23)	<70	0	0.0	0	0.0	3	100.0	0	0.0	3	100.0
	70-79	2	25.0	3	37.5	3	37.5	0	0.0	8	100.0
	80-89	7	18.9	15	40.5	10	27.0	5	13.5	37	100.0
	90+	5	3.2	30	19.5	60	38.7	60	38.7	155	100.0
	Total	14	6.9	48	23.6	76	37.4	65	32.0	203	100.0

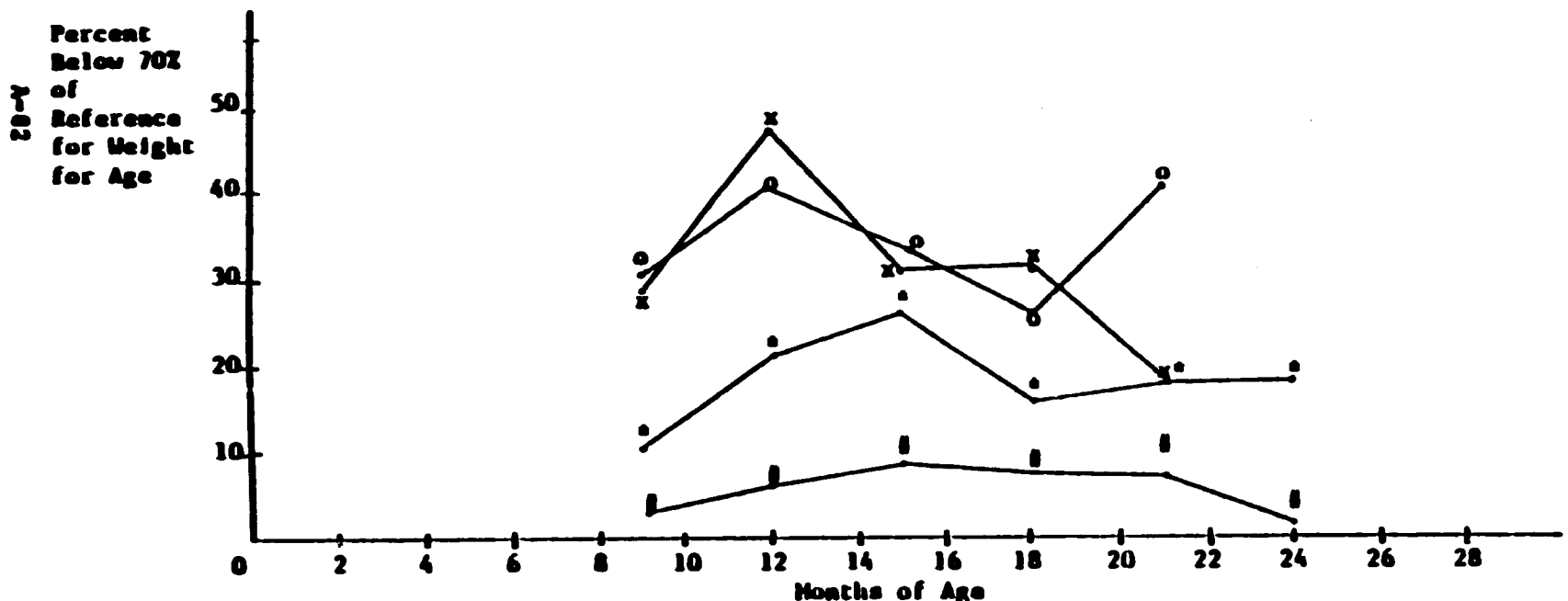
*Based on all children entering the program 1980-1982 in centers recording sex of participants

Part III, Figure 10.

Percentage of Children Less Than 70 Percent of Reference for Weight for Age for Children Entering the Program, Grouped into 4 Cohorts by Nutritional Status at Entry

Sample Size

Months of Age	<70	70-79	80-89	90+
9	35	70	164	732
12	32	54	144	595
15	23	29	114	487
18	19	34	89	361
21	11	20	69	286
24	3	8	32	155



Source: Part III, Table 19B

Percent of Reference at Entry

x = <70
o = 70-79
• = 80-89
▮ = 90+

PART III — TABLE 20

DESCRIPTIVE STATISTICS FOR VARIABLES USED IN FOUR STEPWISE MULTIPLE REGRESSION ANALYSES OF NUTRITIONAL STATUS CHANGES BETWEEN TWO AGES

	Age Interval in Months							
	6-12 (n=701)		12-18 (n=659)		18-24 (n=435)		24-30 (n=280)	
Independent Variables*	$\bar{x}$	S.D.	$\bar{x}$	S.D.	$\bar{x}$	S.D.	$\bar{x}$	S.D.
Weight for age z-score at entry	0.10	1.54	-0.46	1.65	-0.82	1.61	-1.24	1.54
Weight at first age	7.05	1.17	8.18	1.23	9.24	1.32	10.23	1.47
Months in program at first age	2.96	1.78	6.37	3.61	8.98	5.21	9.75	6.84
Participation rate at first age	94.5	10.42	91.4	10.97	89.7	11.81	89.9	11.91
Weight for age z-score at first age	-0.54	1.24	-1.63	1.18	-1.62	1.11	-1.61	1.19
Participation rate at second age	89.1	10.75	88.4	10.05	87.7	10.71	87.6	10.92
Weight at second age	9.16	1.21	9.17	1.34	10.23	1.46	11.47	1.55
Dependent Variable								
Weight for age z-score at second age	-1.68	1.13	-1.71	1.11	-1.60	1.17	-1.34	1.11

*Sex was also included in each analysis as an independent variable. The weights at first and second ages were not included in the actual analyses but are included here for descriptive purposes.

PART III — TABLE 21

SUMMARY OF STEPWISE MULTIPLE REGRESSION RESULTS FOR PREDICTING NUTRITIONAL STATUS (WEIGHT FOR AGE Z-SCORE) AT 12, 18, 24 AND 30 MONTHS OF AGE

Age in Months	Step	Variable Entered	Multiple R	R^2	Increase in R^2	F to Enter	Stepwise F Ratio
12 (n=701)	1	Weight for age z-score at 6 months	0.676	0.457	0.457	587.98	587.98
	2	Sex	0.683	0.467	0.010	12.60	305.17
	3	Participation rate at 12 months	0.688	0.473	0.006	8.09	208.21
	4	Participation rate at 6 months	0.690	0.476	0.003	4.19	157.92
18 (n=659)	1	Weight for age z-score at 12 months	0.723	0.522	0.522	718.48	718.48
	2	Weight for age z-score at entry	0.727	0.528	0.006	8.41	367.49
	3	No months in program at 12 months	0.731	0.534	0.005	7.42	249.86
24 (n=435)	1	Weight for age z-score at 18 months	0.742	0.551	0.551	531.57	531.57
	2	Weight for age z-score at entry	0.753	0.567	0.016	15.59	282.54
30 (n=280)	1	Weight for age z-score at 24 months	0.812	0.660	0.660	538.93	538.93
	2	Weight for age z-score at entry	0.827	0.684	0.024	20.86	299.15

PART III — TABLE 22

STEPWISE MULTIPLE REGRESSION RESULTS FOR PREDICTING WEIGHT AT 12, 18, 24 AND 30 MONTHS OF AGE

Age in Months	Step	Variable Entered	Multiple R	R^2	Increase in R^2	F to Enter	Stepwise F Ratio
12 (n=710)	1	Weight at 6 months	0.711	0.505	0.505	722.80	722.80
	2	Participation rate at 12 months	0.715	0.511	0.006	7.75	368.72
18 (n=663)	1	Weight at 12 months	0.738	0.544	0.544	788.64	788.64
24 (n=437)	1	Weight at 18 months	0.743	0.552	0.552	535.10	535.10
30 (n=280)	1	Weight at 24 months	0.80	0.650	0.650	515.77	515.77

The independent variables used in all four analyses are:

Weight at first age
Sex
Months in program at first age
Participation rate at first age
Participation rate at second age

PART III — TABLE 23

COMPARISON OF PARTICIPANTS IN KOUNGHEUL AND MBAR CENTERS* OF SINE SALOUM WITH NON-PARTICIPANTS IN PPNS VILLAGES IN SINE SALOUM FOR WEIGHT FOR AGE PERCENT OF REFERENCE

Age in Months	Weight for age % Median	Participants in Koungheul and Mbar		Part I Non-participants in PPNS Villages		Total	
		Freq	%	Freq	%	Freq	%
<6	<70	0	0.0	0	0.0	0	0.0
	≥70	24	100.0	44	100.0	68	100.0
	Total	24	100.0	44	100.0	68	100.0
6-11	<70	4	9.5	1	6.3	5	8.6
	≥70	38	90.5	15	93.7	53	91.4
	Total	42	100.0	16	100.0	58	100.0
12-17	<70	5	17.9	3	14.3	8	16.3
	≥70	23	82.1	18	85.7	41	83.7
	Total	28	100.0	21	100.0	49	100.0
18-23	<70	3	10.3	0	0.0	3	8.6
	≥70	26	89.7	6	100.0	32	91.4
	Total	29	100.0	6	100.0	35	100.0
24-29	<70	0	0.0	1	8.3	1	2.7
	≥70	25	100.0	11	81.7	36	97.3
	Total	25	100.0	12	100.0	37	100.0
30-35	<70	0	0.0	2	18.2	2	8.3
	≥70	13	100.0	9	87.8	22	91.7
	Total	13	100.0	11	100.0	24	100.0
36+	<70	3	5.5	1	1.9	4	3.7
	≥70	52	94.5	52	98.1	104	96.3
	Total	55	100.0	53	100.0	106	100.0

*Using October 1982 attendees' data

Homogeneity of association across strata $\chi^2_6 = 12.16$, $p > 0.05$

Overall degree of association $\chi^2_1 = 0.379$, $p >> 0.10$

PART IV — TABLE 1

MOTHER'S KNOWLEDGE

	Good	Poor
Growth Charts	29 (66%)	15 (34%)
General Health	18 (41%)	26 (59%)

PART IV — TABLE 2

MOTHERS' MOTIVATION

	Understand	Don't Understand
Program Objectives	33 (75%)	11 (25%)
Commit of Regular Attendance	42 (95%)	2 (5%)
	Yes	**No**
Attend without Food	42 (95%)	2 (5%)

PART IV -- TABLE 3

MOTHERS' INITIATIVE

CENTER	Committee Activities Undertaken or Planned No	Yes	If yes, Designate	In-program Rating on Scale 1-5
Camberene	x			1
Ziguinchor		x	Mothers built center plus maternity unit	4
Affiniam		x	Thinking about gardening project	3
Bignona	x			1
Faoune	n.a.	Field team unable to interview mother committee member.		
Touba Bele	x			1
Velingara		x	Gardening and chicken-raising	5
Gae		x	Gardening	5
Thille Boubacar	x			1
Waounde	x			1
Naka	x			1
N'Diarekha		x	Thinking about establishing collective farms	3
Nbar		x	Collected money to build a new warehouse even though no food had arrived over several months	4
Pambal	x			1
MB Sirakh		x	Gardening and chicken-raising	5
Mbour		x	Thinking about cloth-dying project to raise money to pay for medicine	3

Source: May 1983 Field Work Questionnaire.

A-88

PART IV — TABLE 4

MOTHERS' TIME IN PROGRAM:
NUMBER OF CHILDREN ENROLLED FOR 43 MOTHERS INTERVIEWED

	Children Now Enrolled			Children Formerly Enrolled			Children Ever Enrolled		
	Mother* No. 1 (N=14)	Mother No. 2 (N=15)	Mother No. 3 (N=14)	Mother* No. 1 (N=14)	Mother No. 2 (N=15)	Mother No. 3 (N=14)	Mother* No. 1 (N=14)	Mother No. 2 (N=15)	Mother No. 3 (N=14)
Total Children:	18	22	21	27	29	28	45	51	49
Average Children/Mother:	1.29	1.48	1.5	1.93	1.93	2.0	3.2	3.4	3.5

* Mother No. 1 is Committee member.

Source: May 1983 Field Work Questionnaire.

PART IV -- TABLE 5

CENTER SETTING AND DIRECTOR CHARACTERISTICS

Center	Type of Center	Age of Center	Qualification of Director	Length of Training	Director Time in Center
Camberene	Dispensary	5 years	Medical Technician	2 years	4 years
Ziguinchor	Social Sub-center	10 years	Community Health Worker	5 months	9 months
Affiniam	Religious MCH	est. 7 years	State Nurse	3 years	3 years
Bignona	Dispensary	3 years	State Nurse	3 years	3 years
Faoune	Health Hut	4 years	Community Health Agent	2 years	2 years
Touba Bele	Dispensary	5 years	State Nurse	3 yrs.(N*)	3 years
Velingara	Dispensary	4 years	Nurse's Aide	2 years	2½ years
Gae	Dispensary	est. 7 years	State Nurse/Midwife	3 yrs.(N*)	1 year
Thille Boubacar	Dispensary	5 years	State Nurse	3 years	5 years
Waounde	Dispensary	6 years	State Nurse	3 years	6 years
Maka	Dispensary	10 years	State Nurse	3 yrs.(N*)	10 years
N'Diarekhe	Dispensary	unknown	Health Agent	2 years	7 months
Mbar	Dispensary	10 years	Medical Technician	2 years	10 years
Pambal	Religious Dispensary	2 years	Teacher	3 yrs.(N*)	2 years
MD Sirakh	Dispensary	8 years	State Nurse	3 yrs.(N*)	4 years
Mbour	Social Sub-center	est. 18 years	Social Assistant	3 yrs.(N*)	2 years
Average		6.9 years		2.5 years	3.7 years

* including nutrition training

Source: Field Work I and Field Work II (May 1983) Field Work Questionnaire.

PART IV — TABLE 6

SUPERVISION: VISIT EFFECTED OR NOT DURING THE PAST YEAR

	Regional Doctor	Departmental Doctor	Regional Coordinator	Departmental Coordinator	Cathwel	Other
Total	3	3	11	12	11	1
Percent of Centers	19%	25%	69%	75%	69%	6%
Percent of Total Visits	7%	10%	26%	29%	26%	2%

PART IV -- TABLE 7

WORKLOAD, NUMBER OF CHILDREN, GROUPS OR WEIGHING DAYS, AND AVAILABLE HELP

Center	Total Number Children Served	Number of Groups or Weighing Days	Number of Children in Group	Available Help	Ratio of Children to Available Help	Ratio of Children in Weighing Sessions to Help	In-program Rating Number Per Group Scale 1-5
Camberene*	350	10	35	3	1:117	1:12	3
Ziguinchor	272	8	34	3	1:91	1:11	4
Affiniam	238	7	34	2	1:119	1:17	4
Bignona	284	4	71	4	1:71	1:18	1
Facune	132	4	33	1	1:132	1:33	4
Touba Bele	264	8	33	2	1:132	1:17	4
Velingara	108	4	27	3	1:36	1:14	5
Gae	344	8	43	4	1:86	1:11	3
Thille Boubacar	527	12	44	2	1:263	1:22	2
Nacounde*	350	7	50	2	1:175	1:25	2
Naka	150	6	25	3	1:50	1:8	5
M'Diarekhe	192	8	24	1	1:192	1:24	5
Mbar	342	9	38	4	1:86	1:10	3
Pambal	441	9	49	4	1:110	1:12	2
MB Sirakh	280	8	35	1	1:280	1:35	4
Mbour	741	13	57	4	1:185	1:14	1
Average	313	7.8	39	2.7	1:133	1:18	

Sources: CRS Master Charts for January 1983, except for * asterisked centers for which information on total number of children and groups was obtained from Field Work I questionnaire answers.
Ma, 1983 Child [illegible] Questionnaire.

PART IV — TABLE 8

AVAILABILITY OF TEACHING MATERIALS

	Educational Materials				Food Demonstration Materials	
	Reference		Audio-Visual			
	Yes	No	Yes	No	Yes	No
Total	12	4	4	12	7	9
Percent	75%		25%		44%	-

Sources: May 1983 Field Work Questionnaire

PART IV — TABLE 9

NUTRITIONAL VALUE OF PROGRAMMED AND AVAILABLE TITLE II RATIONS

	Quantity		Nutrients	
	Kilograms per Month	Grams per Day	Calories per Day	Protein per Day
Programmed Ration Per Beneficiary	7.5	250	945	43
Actual Ration per Beneficiary (80% received in Center)	6.0	200	756	34
Ration Received by Family or Mother (1 ration x 2.45 for one mother and 1.45 children)	14.7	490	1852	84
(Requirements of two-year old child:			1360	37)

Sources: May 1983 Field Work Questionnaire
CRS Compiled Information, by Center
Commodities Reference Guide, calories and protein grams for Title II foods, per 100 grams: CSM, 380 cals, 20 prot.; SF Grits, 360 cals, 16 prot.; SF Cornmeal, 392 cals, 13 prot.

PART IV — TABLE 10

LENGTH OF TIME TITLE II FOOD LASTS IN THE HOUSEHOLD

Mothers' Responses to How Long Each of the Title II Food Lasts

Number of Days

	CSM	Sorghum	Cornmeal Semoule
Average	14.6	13.3	12.4
		12.7	

Source: May 1983 Field Work Questionnaire

APPENDIX B

Description of the CRS Program

The Nutrition and Health Program for Vulnerable Groups* (PFNS-GV) for which CRS provides food and a growth surveillance system, is countrywide. BANAS (Bureau d'Alimentation et de la Nutrition Appliquee au Senegal) is the supervisory agency within the Ministry of Health responsible for the program in cooperation with Cathwel. The feeding and health activities in which CRS participates are governed by a general agreement (the original of which was signed in 1960, and then renewed in 1973). The BANAS/PFNS program is governed by a separate contract which was signed in January 1973. The objectives set forth in this agreement are general in nature and call for nutritional and health protection of vulnerable groups described as under-five children and pregnant/lactating women. Article VI deals with evaluation and notes that since the "fundamental objective" therein is "making understood the important relationship that exists between food and growth, between foods of different values and child health," an evaluation should then study growth gains and mortality in relation to rates of food supplementation. Section 5 specifically calls for a "technical and administrative evaluation to be made every two years by BANAS for submission to CRS through the Ministry of Health in the name of the Government of Senegal. Not all of the provisions of the convention have been carried out, e.g., the program does not target pregnant and lactating women, but furnish food and education to the mothers of under-five children.

The CRS-sponsored program in Senegal is carried out in locally run centers, the majority of which are government dispensaries. Center sites can be recommended by the Regional Medecine-Chef. However, CRS must assure that there is a person at the center who is willing and available to carry out the program, that there is adequate space for the weighing and other activities, and that there is adequate storage space for the foods. Once all these basics are assured, Cathwel and the requesting center make an agreement which includes the following points:

- Children under five and their mothers may be registered in the program; and one mother may not bring more than two children.
- Growth surveillance of the children must be carried out using an acceptable growth surveillance system.
- Food rations, with both nutritional and economic value, are supplied regularly by CRS and distributed properly by the center.
- Mothers are taught during the monthly session, held before food distribution, the use of the donated foods and their local equivalents. At these monthly sessions mothers are also taught, by means of the growth chart, other important factors that affect the nutritional status and the progress of their children.
- Mothers, at registration, are asked to make a commitment to attend the program regularly, to participate in all the program activities, and to do all that they can to make their children grow adequately.

The number of centers has increased rapidly from 132 in FY 1976 to 434 in September of 1981. Over 400 centers are operating currently in all of the regions of Senegal with a majority in Sine-Saloum, Casamance, and Fleuve. Beneficiaries include an estimated 110,000 children and 90,000 mothers in normal times.

Coverage of under-five children in the country range from 1.5% in Cap Vert to 28% in Fleuve Region. Coverage in Sine-Saloum for the first calendar year quarter of 1982 was 8.6% Overall country coverage was 10%.

Corn-Soya-Milk (CSM) and either soy-fortified cornmeal or soy-fortified sorghum in quantities of 3.75 kg. each are distributed monthly to each mother or child, or 7.5 kilograms per individual. Minimally a mother-child pair receives 15 kg. of food per month, CRS has calculated the actual program average received per beneficiary family at 2.2 rations or 16.5 kilograms per family per month.

The CRS program in Senegal is the only one in Africa using "traditional" commodities rather than the usual mixture of cereal/milk/oil in a 2:2:1 ratio.

Data Collection at Each Center

The procedures used in the growth surveillance system at the PFNS centers are as follows.

Mothers are required to bring their children to the program monthly on an assigned day. On that day, the children are weighed on a beam scale, accurate to 100-200 g. The weight is then recorded on the child's individual growth chart and also in the center's growth register. Age in months is also recorded. Weight-in-kilos is then plotted against age-in-months on a Master Chart and the child's percent of Harvard Standard is calculated from the Harvard Standard growth curves, which are superimposed on the weight-for-age guide. All the children attending a center on one day are plotted on this chart; hence the name "Master Chart."

Once the dot is made on the Master Chart for the child and his/her percent calculated, a large dot is then made on the individual chart at the correct percent line.

It can be seen that the Master Chart has two main functions:

1. To determine a child's percent of standard so that the individual chart may be filled in.

2. To follow the nutritional status of the group of children as a whole.

Nutritional status is reported not only at the center level but also at the national CRS office in Dakar and at the CRS Africa Regional Office in Nairobi.

The individual growth chart has a number of functions, which include:

1. It is an educational tool for the mother to show her the progress of her child and the relationship of good growth to good feeding.

2. It is a diagnostic tool for the health worker to check if the child is growing adequately.

3. It is an evaluation tool (less frequently used this way) when longitudinal data on the program is needed in addidtion to Master Chart data.

4. It is a check on the mother's commitment to feed her child adequately.

5. It is a membership card which shows that the child has been registered in the program.

Ideally, in order to carry out functions 1., 2., and 4., the center personnel should also speak to the mothers, about the progress of their children, at the time of recording age, weight and standards.

Data Collection Dakar

At the end of each month, nearly all of the centers send the Master Charts which have been plotted that month to CRS/Dakar. Centers are also supposed to send monthly reports on the amount of food distributed, amount of money collected, number of beneficiaries, new enrollments, etc.

Both the Master Charts and the monthly report forms are collated and summarized at CRS/Dakar. Master Chart summaries are prepared monthly for each center and subsequently for each region. These summaries contain the numbers of children in ten percentage-of-standard ranges (below 60, 60-65, 65-70, and so on up to 100) and also the number and percent of children below 80% of the standard." A summary sheet containing the above information is kept for each center. About every six or nine months, a Master Chart summary report is prepared. Information on centers by region is prepared as well as regional summaries and graphs. Included also, in addition to percents of underweight children, is an evaluation of the quality of Master Charts from each center.

Monthly report forms are used administratively for such purposes as calculating the amount of food needed for delivery to the centers for the next quarter. One can also get some idea of the regularity of attendance at the center, whether or not the correct ration is being given, etc.

CRS/Dakar has devised an efficient system for compiling and checking these reports. Eight people on the CRS staff are each responsible for one region. Each region and each department has a separate dossier so that errors or omissions are easily followed. Master Chart data, however, is kept in a separate book, with one sheet for each center. Centers are still filed by

region and by department so that cross-checking of Master Charts and monthly reports is very easy.

Because of the difficulty, however, in making frequent checks of the original monthly reports and the original Master Charts, the data collection from these sources must, at present, be classified as only fairly reliable.

APPENDIX C

Anthropometric Definitions of Malnutrition

Introduction

This appendix is intended to provide a brief discussion of statistical results which were obtained to examine the definition of malnutrition by the use of two different cutoff points for weight for age percent of reference and to explore classification results and interrelationships among five anthropometric measures for two statistics, viz., the z-score and the percent of median. The results presented in this appendix are based on all children in the study sample who had at least one anthropometric statistic (approximately 2,000 children). These results should be considered rather more qualitative than quantitative for their extension to other LDCs because of their being conditional on the age and sex distribution of this sample. Nevertheless, they are based on a regional random sample of children under 5 years of age and can probably be considered to be generally consistent for other regions of Senegal and extend to similar situations in other less developed countries.

Sensitivity and Specificity of 70 and 80 Percent of Reference for Weight for Age as Definition Points of Malnutrition

There were 2,012 children for whom weight for age and weight for height statistics were both available. For purposes of comparing two cutoff points for defining malnutrition on the basis of weight for age percent of median (WAPM), all children were categorized according to whether their weight for height z-scores were less than -2 or greater than or equal to -2. Approximately 2.5 percent of a normal population would be expected to be considered malnourished based on this criterion. Table 1A provides the cross classification of weight for height z-score categories with the weight for age percent of median categories for the 70 percent and 80 percent cut points.

Based on the categorization of the weight for height z-score, 6.4 percent of these 2,012 children would be considered malnourished. The corresponding percentages of children defined as malnourished according to 70 percent and 80 percent of median for weight for age are 12.1 percent and 35.2 percent respectively. Thus, the overall percentage of children defined as malnourished according to weight for height z-score is closer to that percentage defined as malnourished based on 70 percent of reference for age.

The frequencies of Table 1A were used to estimate the probabilities included in Table 1B. These probabilities are defined in Fleiss's book Statistical Methods for Rates and Proportions and are commonly used for evaluating the performance of diagnostic tests*. The sensitivity of the WAPM cutpoint of 70 percent is 0.434. That is to say that this [illegible] the probability of a child being defined as malnourished based on this cr[illegible]n, given that the child is considered malnourished based on weight for heig[illegible] z-score. It can be seen that the 80 percent cut point for WAPM yields a more sensitive indicator of

*We will use the complement of Fleiss' definition of specificity as it is more widely used in epidemiology.

malnutrition as the sensitivity is 0.775 for this cutpoint. However, the 80 percent cutpoint for WAPM is seen to be much less specific than the 70 percent point. This is because approximately 90 percent of the children considered normal based on weight for height z-score are considered normal according to 70 percent WAPM criterion, whereas only two-thirds, 67.7 percent are correctly classified based on 80 percent WAPM.

The predictive value of the WAPM cutpoint is defined as the probability of a child below the WAPM cutpoint being malnourished based on his/her weight for height z-score. These results indicate that the WAPM 70 percent cutpoint is more predictive by this definition. However, it should be noted that the predictive values for both cutpoints are low, i.e. 0.228 for 70 percent WAPM and 0.141 for 80 percent WAPM.

This table also includes the estimated false positive and false negative error rates which would be expected to obtain if the 70 percent or 80 percent WAPM were used as a screening test. The false positive rate is the complement of the predictive value, and it can be seen that the 70 percent WAPM cutpoint yields a lower false positive rate than the 80 percent cutpoint. However, both of these false positive rates are very large. The 80 percent WAPM cutpoint yields a somewhat lower false negative rate and both of these rates are very low.

These results provide a description of the classification which could be expected based on these cutpoints. These statistics, particularly the false positive and negative error rates, must be evaluated for the two cutpoint choices vis a vis their intended use in Senegal, e.g. screening or surveillance.

In table 2 we can examine the effect of using the 70 percent or the 80 percent cut off point of weight per age in a typical center with 201 children. We assume that there are 13 children (6.5 percent) malnourished i.e., below-2 S.D. of weight per height. If we use the 70 percent cut off point, then 6 of these 13 children will be considered malnourished. If we use the 80 percent cut off point 10 of the 13 malnourished children will be included. On the other hand, the false positive rate will increase much more drastically. Using the 70 percent cut off 19/188 children will be classified as malnourished who are not. Using the 80 percent cut off point 61/188 children will be misclassified when they are not. This difference in specificity would cause a great deal of misclassification which would make surveillance using this cut off point much less efficient. On the other hand, for screening purposes where selection of individuals for treatment is the goal, sensitivity is usually considered more important and in this case, an 80 percent, or perhaps even higher, cut off might be more appropriate.

If surveillance is the desired use of WAPM then the 70 percent cutpoint can be recommended based on its predictive value, specificity and its smaller statistical variation (See, for example, figures 1-2 of the results for Part 2). However, any percent of median statistic should be used very cautiously for analytic or comparative purposes as this statistic is age-related. This topic is addressed later in this Appendix.

Comparison of the Five Anthropometric Measures and Their Classification of Malnutrition in Children

The data for these children were used in several ways to explore the relationships among the anthropometric measures. For the purposes of these comparisons the WAFM 70 and 80 percent cutpoints were chosed to define malnutrition in this sample. The cumulative distributions for all anthropometric measures were used to determine the cutpoints of the percent of median statistics which would yield percentages of malnourished children corresponding to the percentage defined as malnourished by the 70 and 80 percent WAFM cutpoints. These corresponding percent of median cutpoints are included with their approximate (no standardization for age was performed) z-scores in Table 3.

All children with available data were categorized by each pair of anthropometric measures and for each cutpoint, and the percentage of correct classification (in agreement) in each fourfold table was calculated. These percentages are presented in Table 4.

The important findings of the table are that the lower cutpoints yield better agreement among the anthropometric measures and that the two arm circumference measures demonstrate the highest percentages of agreement. For the cutpoints corresponding to 70 percent WAFM, the percentages of agreement for all pairs of anthropometric measures are at least 80 percent.

Linear Association Between Pairs of Anthropometric Measures for Two Statistics

The pairwise Pearson product moment correlation coefficients based on z-scores and percent of median statistics are presented in Table 5 for the ten pairs of anthropometric measures. The arm circumference measures were highly correlated for both statistics and weight for age was highly correlated with weight for height for both z-score and percent of median. Weight for age z-scores also correlated highly with both height for age and arm circumference for age. Height for age and weight for height were not at all correlated for either statistic.

Important Considerations Regarding the Percent of Median Statistic

Some investigations, including this one, have used percentage of median statistics for categorizing children into nutritional levels because this statistic has often been used for this purpose in studies of this type. The results of Table 6 were derived from the NCHS/CDC anthropometric standard and show that this statistic fluctuates (generally increases) with age and stature. Obviously, this is an undesirable property for a statistic to possess.

The z-score is a measure of relative position of a child's size and is related to a child's percentile. Thus, if a child maintains his/her size relative to the reference population, then his/her z-score (and percentile) remains constant. However, the results of Table 6 demonstrate that under these circumstances a child's percent of median will <u>not</u> remain constant and will, in fact, generally increase with age (until approximately 36 months of age) or stature even though the child has not improved relative to the reference population! These increases occur for both sexes and are most pronounced for

weight for age and weight for height and are probably of negligible importance for height for age.

The authors would like to caution other investigators against the use of this statistic for evaluating changes in nutritional status among a group of children when no suitable comparison group is available. One can imagine a group of children all entering a feeding program at 3 months of age with z-scores for weight for age near -2.0. These children would therefore have percent of median statistics near 70 percent. At 2 years of age, all of these children would be at 80 percent of median or greater even if each child had maintained his/her exact position relative to standard. Consequently, if a suitable comparison group is not available for evaluating the nutritional impact of an intervention program, the statistical analysis of results should be based on either z-statistics or percentile frequencies for the participants.

APPENDIX C -- TABLE 1A

COMPARISON OF TWO CUTPOINTS FOR WEIGHT FOR AGE PERCENT OF REFERENCE (WAPM) BY CATEGORIZATION RESULTING FROM WEIGHT FOR HEIGHT Z-SCORES (WHZ)

Weight for Height z-score		Weight for Age Percent of Reference											
		<70		≥70		Total		<80		≥80		Total	
		Freq	row %	Freq	row %	Freq	row %	Freq	row %	Freq	row %	Freq	row %
<-2	Freq	56	43.4	73	56.6	129	100.0	100	77.5	29	22.5	129	100.0
	Col %	22.8		4.1		6.4		14.1		2.2		6.4	
≥-2	Freq	190	10.1	1693	89.9	1883	100.0	609	32.3	1274	67.7	1883	100.0
	Col %	77.2		95.9		93.6		85.9		97.8		93.6	
Total	Freq.	246	12.1	1766	87.8	2012	100.0	709	35.2	1303	64.8	2012	100.0
	Col %	100.0		100.0		100.0		100.0		100.0		100.0	

APPENDIX C -- TABLE 1B

HYPOTHETICAL* SENSITIVITY, SPECIFICITY, PREDICTIVE VALUE AND ERROR RATES FOR TWO CUTPOINTS FOR WEIGHT FOR AGE PERCENT OF REFERENCE

Measure	Definition	Observed Value for WAPM Cutpoint 70%	80%
Sensitivity	P(wapm < cutpoint|wh z-score < -2)	0.434	0.775
Specificity	P(wapm ≥ cutpoint|wh z-score ≥ -2)	0.899	0.677
Predictive Value	P(wh z-score < -2|wapm < cutpoint)	0.228	0.141
False Positive Rate	P(wh z-score ≥ -2|wapm < cutpoint)	0.772	0.859
False Negative Rate	P(wh z-score < -2|wapm ≥ cutpoint)	0.041	0.022

*Based on Table 1A, adopting weight for height z-score categories as "true" state

APPENDIX C — TABLE 1A

COMPARISON OF TWO CUTPOINTS FOR WEIGHT FOR AGE PERCENT OF REFERENCE (WAPM) BY CATEGORIZATION RESULTING FROM WEIGHT FOR HEIGHT Z-SCORES (WHZ)

Weight for Height z-score		Weight for Age Percent of Reference: <70 Freq	<70 row %	≥70 Freq	≥70 row %	Total Freq	Total row %	<80 Freq	<80 row %	≥80 Freq	≥80 row %	Total Freq	Total row %
<-2	Freq	56	43.4	73	56.6	129	100.0	100	77.5	29	22.5	129	100.0
	Col %	22.8		4.1		6.4		14.1		2.2		6.4	
≥-2	Freq	190	10.1	1693	89.9	1883	100.0	609	32.3	1274	67.7	1883	100.0
	Col %	77.2		95.9		93.6		85.9		97.8		93.6	
Total	Freq.	246	12.1	1766	87.8	2012	100.0	709	35.2	1303	64.8	2012	100.0
	Col %	100.0		100.0		100.0		100.0		100.0		100.0	

APPENDIX C — TABLE 1B

"HYPOTHETICAL" SENSITIVITY, SPECIFICITY, PREDICTIVE VALUE AND ERROR RATES FOR TWO CUTPOINTS FOR WEIGHT FOR AGE PERCENT OF REFERENCE

Measure	Definition	Observed Value for WAPM Cutpoint: 70%	80%
Sensitivity	P(wapm < cutpoint|wh z-score < -2)	0.434	0.775
Specificity	P(wapm < cutpoint|wh z-score ≥ -2)	0.101	0.323
Predictive Value	P(wh z-score < -2|wapm < cutpoint)	0.228	0.141
False Positive Rate	P(wh z-score ≥ -2|wapm < cutpoint)	0.772	0.859
False Negative Rate	P(wh z-score < -2|wapm ≥ cutpoint)	0.041	0.022

*Based on Table 1A, adopting weight for height z-score categories as "true" state

APPENDIX C — TABLE 2

EXPECTED* FREQUENCY DISTRIBUTIONS FOR WEIGHT FOR AGE PERCENT -- REFERENCE BY WEIGHT FOR HEIGHT Z-SCORE FOR A TYPICAL CENTER WITH 201 CHILDREN IN THE FEEDING PROGRAM

Weight for Height z-score	Weight for Age Percent of Reference					
	<70	≥70	Total	<80	≥80	Total
<-2	6	7	13	10	3	13
≥-2	19	169	188	61	127	188
Total	25	176	201	71	130	201

*Based on results presented in Table 1A

APPENDIX C -- TABLE 3

PERCENTAGE OF MEDIAN CUTPOINTS AND Z-SCORES FOR FOUR ANTHROPOMETRIC MEASURES CORRESPONDING TO 70 AND 80 PERCENT OF REFERENCE OF WEIGHT FOR AGE BASED ON THE OBSERVED CUMULATIVE DISTRIBUTIONS

Weight for Age		Percentage of children	Weight for Height		Height for Age		Arm circumference for age		Arm circumference for height	
% Median	Z-score		% Median	Z-score	% Median	Z-score	% Median	Z-score	Median	Z-score
<70	-2.85	11.4	84.66	-1.66	85.25	-3.69	79.10	-10.65	83.49	-2.11
<80	-1.92	32.6	91.92	-0.90	91.23	-2.25	84.55	- 2.02	89.14	-1.41

APPENDIX C — TABLE 4

COMPARISON OF PERCENTAGE OF CHILDREN SIMILARLY AND SIMULTANEOUSLY CLASSIFIED* BY PAIRS OF ANTHROPOMETRIC MEASURES† OF NUTRITIONAL STATUS BASED ON EMPIRICALLY ESTABLISHED CUTPOINTS OF THE WEIGHT FOR AGE CUMULATIVE DISTRIBUTION

Cutpoints§ corresponding to WAPM <70% of Reference				
	WHMP	HAPM	AAPM	AHPM
WAPM	86.4	89.9	87.1	85.2
WHPM		80.4	88.6	88.9
HAPM			82.4	80.8
AAPM				95.3

Cutpoints§ corresponding to WAPM <80% of Reference				
	WHMP	HAPM	AAPM	AHPM
WAPM	76.0	80.4	78.1	71.5
WHPM		58.1	78.0	78.4
HAPM			66.8	60.3
AAPM				89.0

*As either above or below the cutpoints of both indicators

†WH = weight for height
HA = height in age
AA = arm circumference for age
AH = arm circumference for height

§See Table 3 for actual values of cutpoints

APPENDIX C — TABLE 5

PAIRWISE PEARSON PRODUCT MOMENT CORRELATION COEFFICIENTS AMONG FIVE ANTHROPOMETRIC VARIABLES FOR TWO STATISTICAL MEASURES FOR ALL CHILDREN (n=2000)

z-score

	Weight for Height	Height for Age	Arm Circumference for Age	Arm Circumference for Height
Weight for Age	0.598	0.790	0.731	0.444
Weight for Height		0.006	0.608	0.629
Height for Age			0.430	0.069
Arm Circumference for Age				0.893

Percent of Median

	Weight for Height	Height for Age	Arm Circumference for Age	Arm Circumference for Height
Weight for Age	0.854	0.135	0.151	0.135
Weight for Height		0.031	0.297	0.326
Height for Age			0.413	0.109
Arm Circumference for Age				0.888

195

APPENDIX C -- TABLE 6

PERCENT OF MEDIAN STATISTICS FOR Z-SCORE VALUES BY AGE AND SEX FOR THREE ANTHROPOMETRIC MEASURES BY AGE OR STATURE

		Males		Females		
		z-score		z-score		
		-1.0	-2.0	-1.0	-2.0	
Weight for Age						
Age in Months	3	83.3	68.3	87.0	72.2	
	6	88.5	75.6	87.5	76.4	
	9	89.1	78.3	88.4	76.7	
	12	89.2	79.4	89.5	77.9	
	24	91.0	82.1	89.8	80.0	
	36	89.0	78.1	89.4	79.4	
	48	88.6	77.2	89.4	78.8	
	60	88.8	77.0	88.7	78.0	
Weight for Height						
Length* in cm (boys)	61.0	89.8	78.0	89.1	78.2	60.0
	68.0	91.3	81.3	89.0	79.5	66.0
	72.0	91.2	82.4	90.5	81.0	70.0
	76.0	92.0	84.0	91.2	81.9	74.0
	86.0	92.6	85.1	91.4	83.6	85.0
	95.0	92.9	85.8	92.6	85.2	94.0
Height for Age						
Age in Months	3	95.7	91.3	96.0	91.8	
	6	96.0	92.0	96.1	92.0	
	9	96.4	92.7	96.2	92.3	
	12	96.5	92.9	96.2	92.3	
	24	96.3	92.5	96.2	92.3	
	36	96.0	92.0	96.1	92.1	
	48	95.9	91.7	96.1	92.0	
	60	95.8	91.6	95.9	91.8	

Length* in cm (girls)

Source: Normalized NCHS/CDC Anthropometric Reference

*Rounded mean length for ages 3, 6, 9, 12, 24 and 36 months

Tabulation Results of Questionnaires from 45 Center Chiefs and Regional Coordinators

A tabulation scale, reflecting the primary concerns of center chiefs, was designed. These subjects were groups into topics: (1) General Remarks; (2) Criticisms; and (3) Suggestions and Recommendations.

The percentages indicate the frequency of the topics raised in the statements of the chiefs of centers. It should be remembered that the interviews were free and key questions were open.

TABULATION

Question 1 - General remarks on the program

- The program is of real interest for nutritional surveillance 51%
- Its objective is not well understood by the beneficiary mothers, who are motivated only by the foodstuffs 42%
- The work is too tiring 13%
- The design methodology is good but the implementation is not satisfactory 6%

Question 2 - Criticisms made of the program

- Supervision by the CRS.
  - Discourteous attitude of supervisors who show disrespect and lack of regard for the agents. 20%
  - CRS supervisors are only interested in the foodstuffs and funds and not in the technical aspects 11%
  - Vague instructors = very frequent changes 6%

  Total: 37%

- Excessive workload
  - The work is too hard 15%
  - It is difficult to fill the master forms 11%
  - Too many documents required (quarterly reports) 6%

  Total: 32%

- o Deficiencies in the training and material resources
  - Lack of means of transport 11%
  - Lack of training and prior orientation of the chiefs of centers. 8%
  - Lack of audiovisual aids and culinary demonstration materials 4%

  Total: 23%

- o Lack of incentives for the agents
  - No indemnities 15%
  - Lack of responsibilities 4%

  Total: 19%

- o Financial contribution of mothers
  - Abnormally centralized management 11%
  - High contribution rate 4%

  Total: 15%

- o Insufficient vaccines and drugs 6%
- o No feed-back regarding the results of evaluations (master forms) 6%

Question 3 - Suggestions and Recommendations

- o Review of foodstuffs:
  - Assure regular supplies 37%
  - Diversification of foodstuffs 23%
  - Elimination of foodstuffs 11%
  - Increase of quantity 4%

  Total: 80%

- o Increase of human and material resources
  - Material resources and means of transport 44%
  - Personnel 24%

  Total: 68%

- Improvement of technical capacity of agents
  - In-service training seminar and increased sensitization 24%
  - Supply of audiovisual aids and culinary demonstration materials 24%

  Total: 48%

- Incentives for agents
  - Indemnities 15%
  - Giving more responsibility to agents 6%

  Total: 21%

- Food production activities for the gradual replacement of assistance food supplies 15%
- More drugs and vaccines 13%
- Extension of the program 6%
- Construction of storage warehouses 6%

Other unquantified wishes and recommendations

- Reduction of staff
- Advertising the PFNS through the media
- Visits by the SANAS team

Question 4 - Was there positive change in the attitudes and behavior of mothers regarding the way their children are fed?

- Yes 57%
- No 27%
- Variable 16%

Question 5 - Does the PFNS have a real impact on the improvement of the children's nutritional status?

- Yes 88%
- No 6%
- Variable 6%

Question 6 - Assessment of the operation of the PFNS center by the chief of center

- Good 58%
- Very Good 27%
- Fair 8%
- Fairly Good 4%
- Bad 2%
- No answer 2%

Question 7 - Do you have any question to ask the evaluation team?

This question was not subject to a quantified tabulation. It was mainly intended to be a stimulus. The main questions noted dealt with:

- Continuation of the program, food supplies in particular.
- Liability of the CRS in case of accident of the agent responsible for the PFNS who travels to implement the program.
- National program or private program, etc.

II. Results of the tabulation of the questionnaire for regional coordinators

Seven (7) out of eight (8) coordinators and three (3) departmental coordinators were interviewed. The method of tabulation is the same as that used in the previous part.

Question 1 - General impressions about the PFNS

- Good design 100%
- Bad implementation 80%
- Good organization 40%

Question 2 - Criticisms made

- Technical component (demonstration nutritional education) not developed 30%
- Excessive workload 20%
- No technical training and prior practice; on-the-job training of agents 20%
- Very strict regulation regarding exclusions for absence (peripheral zones) 10%
- Health protection (immunization) not well done 10%

Implementation

- Food supplies (irregularity) 30%
- Lack of incentives for agents (indemnities and responsibility) 30%
- Lack of audiovisual aids 10%
- Weakness of supervision at the central level 10%
- Abnormal centralization of the CCP (postal account) 10%

Supervision

- Repressive, dogmatic, and selective (foodstuffs and funds only) nature of the control made by CRS 60%
- Difficult to use the supervision vehicle 30%
- Lack of feed-back 10%

Question 3 - Suggestions and Recommendations

- In-service training of agents and sensitization of populations 80%
- Incentives for agents (indemnities and responsibility) 40%

Foodstuffs

- Diversification 20%
- Elimination 10%
- Regularity 15%

Decentralization of the CCP (postal account) (keep the funds locally)

- Reduction of the program 20%

Question 4 - Opinion about:

a. - Incentives for agents
  - No 80%
  - Yes 10%

Competence

- Yes 10%
- No 20%
- No answer 70%

Understanding and support of the medical officer

- Yes 70%
- No 20%

Relationship with the CRS and its agents

- Good 70%
- Bad 20%